

AN-X-DCSNet
Communication
Module

User Manual



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Throughout this manual we use notes to make you aware of safety considerations.

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

These warnings help to:

WARNING!

- identify a hazard
- avoid the hazard
- recognize the consequences

IMPORTANT!

Identifies information that is especially important for successful application and understanding of the product.

TIP

Identifies information that explains the best way to use the AN-X-DCSNet

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AN-X-DCSNET MODULE OVERVIEW	2
Hardware Features	3
Package Contents	3
Other Requirements	3
Modes of Operation	4
INSTALLATION	5
Prevent Electrostatic Discharge	5
Power	5
DCSNet Cabling and Termination	5
Ethernet Cabling	6
Software Installation	6
ETHERNET CONFIGURATION	7
Ethernet Configuration	7
Example: Standalone Computer	12
Reconfiguring an AN-X from an Unknown State	16
DCSNET CONFIGURATION	18
USING THE AUTOMAX PROGRAMMING SOFTWARE	19
Requirements	19
Installing and Configuring the VDD	19
Configuring the Programming Software	20
Multiple Programmer Access	21
Connecting to a Different AN-X	22
SCHEDULED DATA WITH A CONTROLLOGIX	23
Requirements	24

Reference	24
Configuring AN-X in RSLogix 5000	24
Configuring Input-Only Connections	26
Selecting the RPI	28
Mapping the DCS Data	29
Module Name	29
I/O Data	29
Input Data	30
Output Data	30
Status Input Data	31
Sample File	31
Sending the Configuration to AN-X	32
Viewing the Current Configuration	32
Error Log	32
Exporting Tags from AN-X	33
Using RSLogix 5000 to Diagnose Problems	34
General Tab	34
Connection Tab	34
AN-X TO AN-X COMMUNICATION	35
Configuration File Format	35
Sample Configuration File	41
Sending the Configuration to AN-X	41
Error Log	42
USING DDE/OPC TO ACCESS DCS DATA ON THE MODULE	43
USING RSLINX TO VIEW DATA	44
USING ANXINIT	46
AnxInit Log	46
Locating Available AN-X Modules	47
Selecting an AN-X	48

Set AN-X IP Configuration	49
Restart an AN-X	50
AN-X Info	50
Read Kernel Parameters	51
Run Config Mode	51
Update AN-X Flash	51
Update Firmware	52
Firmware Update Wizard	52
Update Firmware Command	56
Patch Firmware	56
USING THE WEB INTERFACE	58
DCSNet Configuration	59
Define AN-X to AN-X Communication	60
Configure ControlLogix Support	61
View Configuration Files	61
View Active Configuration	62
Monitor DCS Data	64
Log Files	65
System Error Log	65
System Info Log	65
AN-X-DCSNet Bridging Log	65
ControlLogix Log	65
View All Logs	65
Administration Menu	65
Browse File System	66
AN-X IP Configuration	66
Archive Configuration	67
TROUBLESHOOTING	68
LEDs	68
Ethernet LEDs	68
SYS LED	68
NET LED – DCS Network Status	69

DCS Diagnostic Counters	69
UPDATING THE FIRMWARE	71
Reading Version Numbers	71
Obtaining the Latest Software	72
SPECIFICATIONS	73
SUPPORT	74

AN-X-DCSNet Module Overview

The AN-X-DCSNet communications module connects a computer or other device to a Reliance DCS network, using Ethernet. The module can act as a DCS master or a DCS slave.

As a DCS master, the module:

- Scans up to 55 slave drops
- Transmits 8 words of broadcast data every 2.8 ms.
- Maintains standard DCS diagnostic counters

As a DCS slave, the module:

- Acts as any drop from 1 to 55, with drop depth from 1 to 55. It supports 32 words of input data and 32 words of output data per drop
- Receives 8 words of broadcast data from the master every 2.8 ms.
- Monitors the input and output data on others drops on the network
- Maintains standard DCS diagnostic counters

You can use the AN-X-DCSNet module to communicate with an AutoMax processor, using AutoMax Programming Executive 3.9A or 4.3A or above. Refer to page 19 for details.

The AN-X-DCSNet module supports exchanging scheduled data over Ethernet with a ControlLogix processor, with RPIs from 5 to 3200 ms. Refer to page 23 for details.

You can use a DDE or OPC server such as RSLinx to access the DCS data directly on the AN-X-DCSNet. The module "emulates" PLC-5 integer files 100-155. Each file corresponds to a DCS drop. Refer to page 43 for details.

As either a DCS master or slave, the module supports direct AN-X to AN-X communication over Ethernet. Use it to pass data between two separate DCS networks. Refer to page 35 for details.

The AN-X-DCSNet module has a web interface for configuration of DCSNet operation and for monitoring operation and data. You can communicate with the module using any standard web browser such as Internet Explorer.

A watchdog timer is implemented in the module's hardware. If the firmware does not kick the watchdog within the timeout period the watchdog times out and places the module into a safe fatal failure state.

A jabber inhibit timer is implemented in the module's hardware. If the network transmitter is on longer than 150% of the longest network frame time, the transmitter is forced off and the module is placed into a safe fatal failure state.

The module firmware can be updated over Ethernet using the Windows utility supplied. Refer to page 71 for details.

Hardware Features



The module has:

- LEDs to indicate the status of the connection to the Ethernet, its own internal state, and the connection to the DCS network
- an Ethernet connector
- a 9-pin D-shell connector to connect to the DCS network
- a power connector

Package Contents

- AN-X-DCSNet module
- CD containing software and documentation

Other Requirements

To use the AN-X-DCSNet with the AutoMax Programming Executive requires:

- version 3.9A or 4.3A or above of the programming executive
- version 3.1.0.4 or above of the Virtual Device Driver

To exchange scheduled data with a ControlLogix processor over Ethernet requires:

- version 12 or above of RSLogix 5000
- version 12 or above of the ControlLogix firmware
- 100 Mbit/second Ethernet network and hardware (ENBT)

Modes of Operation

There are three AN-X modes of operation:

- Boot mode. The AN-X is running its low level startup firmware.
- Configuration mode. This is the mode when you are updating the firmware in the AN-X.
- Production mode. This is the normal runtime mode of operation.

Installation

Prevent Electrostatic Discharge

The module is sensitive to electrostatic discharge.

Electrostatic discharge can damage integrated circuits or semiconductors. Follow these guidelines when you handle the module:

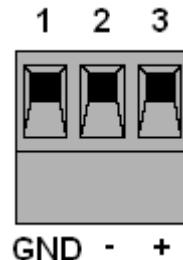
WARNING!

- Touch a grounded object to discharge static potential
- Do not touch the connector pins

Power

AN-X requires a DC power input of anywhere from 12 to 24 VDC.

Left to right the pins on the power connector are chassis ground, negative voltage and positive voltage.



The chassis ground should be connected.

Power consumption internally is 300 mA @ 12VDC or 150 mA @ 24VDC.

The part number for the power connector is Phoenix MSTB 2.5/3-ST-5.08

DCSNet Cabling and Termination

Use a DCSNet drop cable (612574-36R or 612403-036R) and passive tap (M/N 57C380) to connect the module to the coaxial network cable.

The drop cable is a 3-foot long multiconductor cable with 9-pin D-shell connectors at each end. Connect one end to the connector on the module and the other end to the passive tap.

The passive tap has two BNC connectors for connection to the coaxial cables and terminating loads.

The network coaxial cable must be terminated with 75 ohm terminating loads attached to the taps at the physical ends of the network. There should be two and only two terminators on the network.

The DCS network cable can be RG-59/U or RG-11/U.

Ethernet Cabling

AN-X has a standard RJ-45 connector for connecting to Ethernet.

If you are connecting AN-X to an existing network through a router or switch, use a standard Ethernet cable.

If you are connecting a computer or PLC directly to an AN-X, use a crossover cable.

Software Installation

You must uninstall any previous version of the software before you can install a new version. Use the Windows Control Panel Add and Remove Programs to remove the old version.

Insert the CD supplied with the AN-X module and run the program setup.exe on the CD.

Ethernet Configuration

The AN-X-DCSNet module connects a computer or other device on Ethernet to a Reliance DCS network.

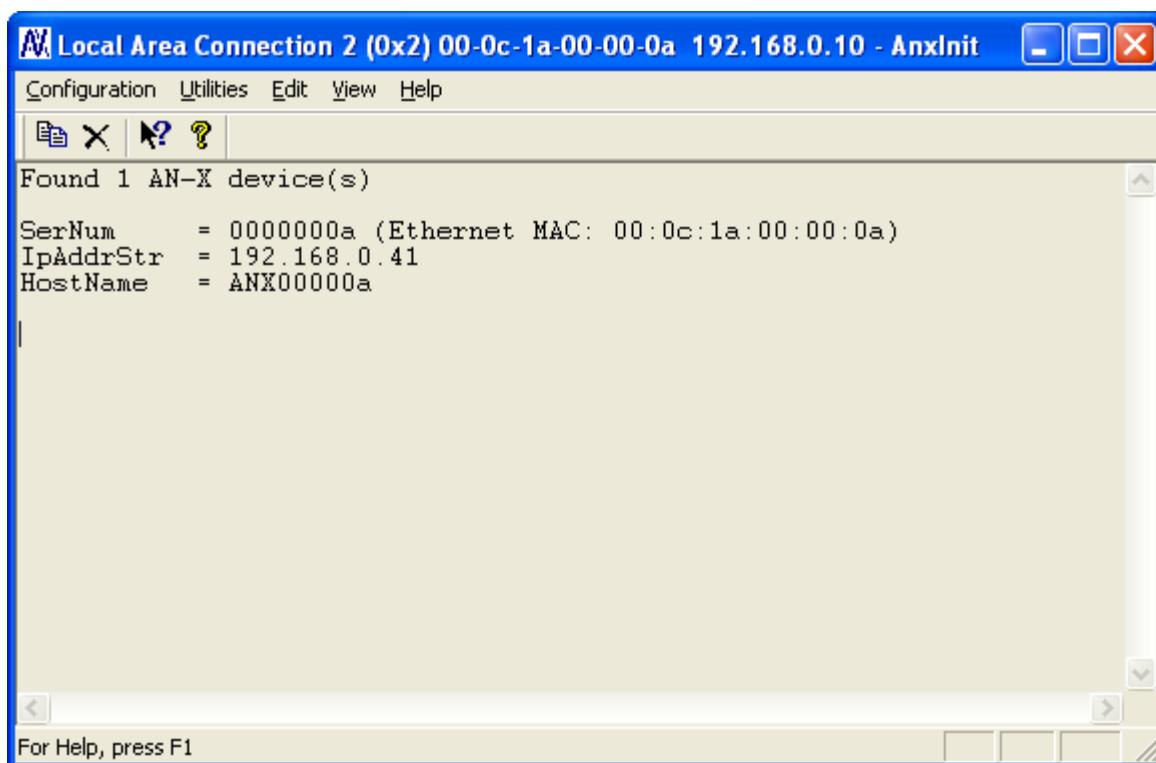
Before you can use the AN-X-DCSNet, you must configure its Ethernet network properties.

Ethernet Configuration

AN-X can be configured to use a static (unchanging) IP address or it can be configured to obtain its IP address from a DHCP server.

Unless you have control of the DHCP server, in most applications you will configure AN-X to use a static IP address. Otherwise the DHCP server may assign a different IP address each time AN-X powers up, and any software that accesses the AN-X module would have to be reconfigured.

AN-X is shipped with DHCP enabled. If it finds a DHCP server on the network, the DHCP server assigns it an IP address. You can use the utility AnxInit to find the IP address that the DHCP server has assigned. Select *Utilities/Locate All AN-X Modules* and AnxInit will locate the AN-X and display its IP address.



If AN-X does not find a DHCP server within about three minutes of starting up, it reverts to a temporary static IP address of 192.168.0.41. If

AN-X is using this temporary IP address, it repeatedly flashes the SYS LED three times followed by a pause.

IMPORTANT!

Use this temporary IP address only for initial setup of AN-X. AN-X will not function for its intended purpose at the temporary IP address.

If you are using multiple AN-X modules, configure one at a time, especially if there is no DHCP server on the network, since they will all revert to the same temporary IP address when they fail to find a DHCP server.

IMPORTANT!

If you are connecting AN-X to an existing Ethernet network, consult the network administrator to obtain a static IP address for AN-X and to obtain other information about how you should configure AN-X.

IMPORTANT!

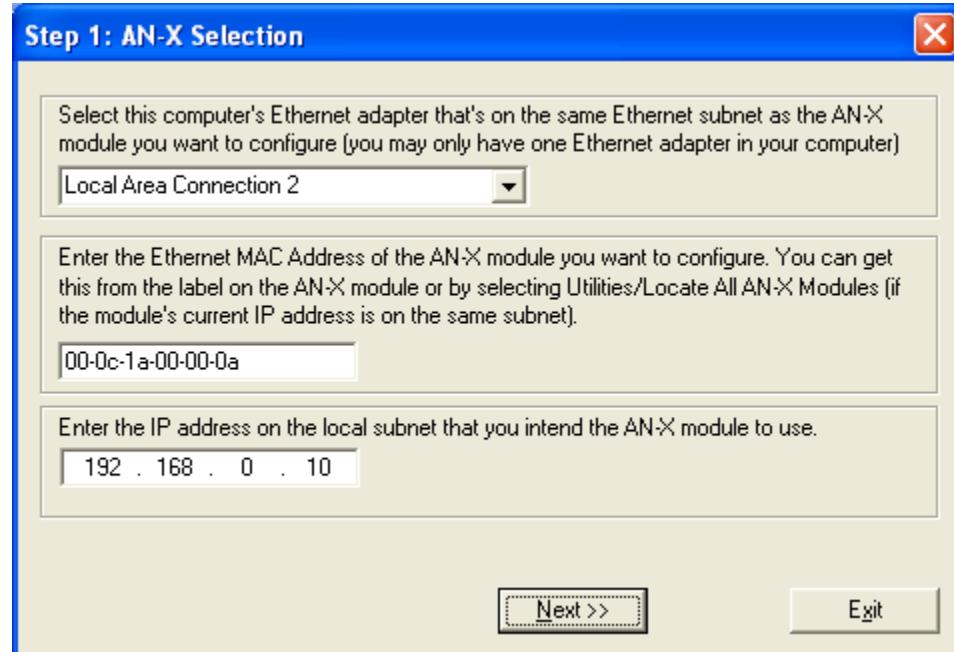
The AN-X must be on the local Ethernet (same subnet as the computer) when you set its IP address.

You configure the Ethernet properties using the Windows utility AnxInit supplied with AN-X. You can also set the IP address through the web interface. Refer to page 66

Use the *Configuration/AN-X IP Settings* command to start the AN-X IP configuration wizard, which takes you step by step through the IP configuration process.

Step 1

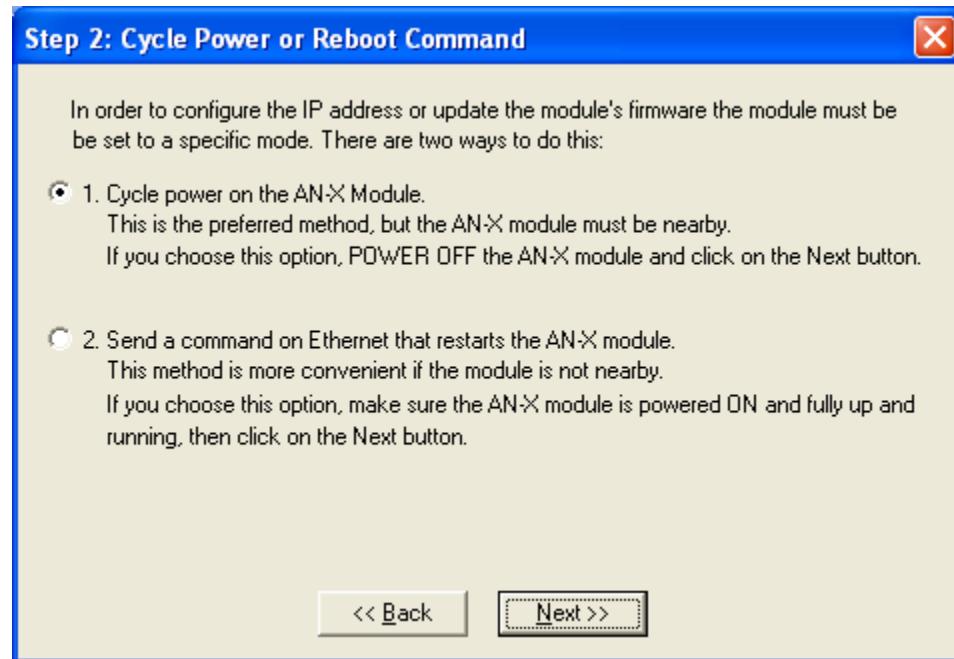
In step 1, you identify the AN-X you are configuring.



1. Select the Ethernet adapter that's connected to the AN-X. In most cases there will be just one Ethernet adapter in the computer. The AN-X must be on the same subnet as the computer.
2. Enter the MAC address of the AN-X you are configuring. This is printed on the AN-X label. It consists of six pairs of hexadecimal digits, separated by hyphens. In the example above, it's 00-0c-1a-00-00-0a.
If the AN-X is already online, you can obtain its MAC address using the *Utilities/Locate All AN-X Modules* command.
3. Enter the IP address you intend the AN-X to use.

Step 2

In step 2, you choose a method of restarting AN-X to put it in boot mode.

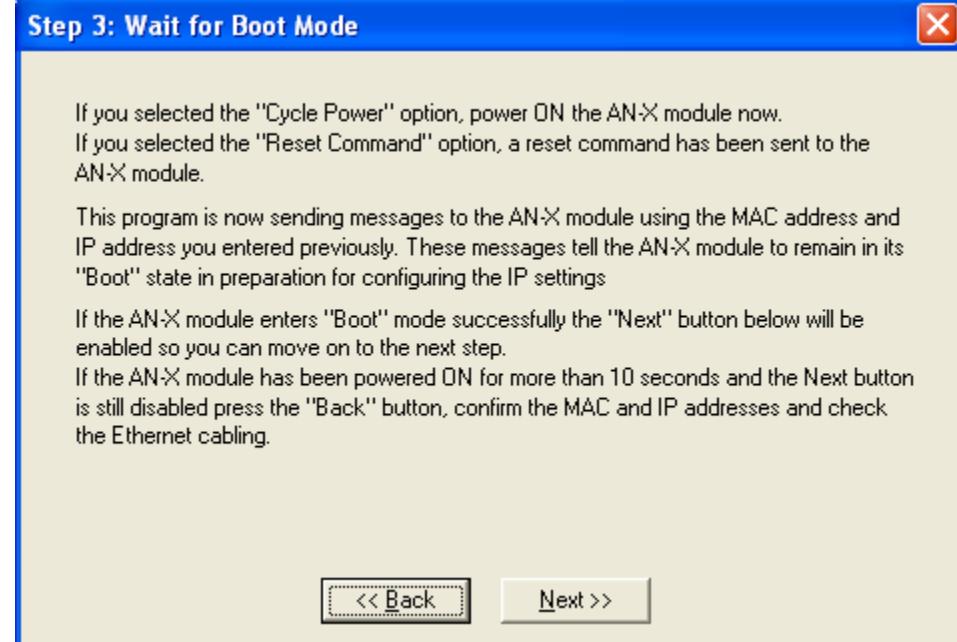


The preferred method is to cycle power on the AN-X. Select the first option on the screen, power off the AN-X, and click the *Next >>* button.

The second method, useful if the AN-X is not easily accessible, is to send it a command over Ethernet. The AN-X must be powered on and completely running for this method to work. For example, if this is the first time you are configuring a new AN-X, allow sufficient time for it to acquire an IP address from a DHCP server or to time out and use its default IP address (about 3 minutes). Select the second option on the screen and click the *Next >>* button.

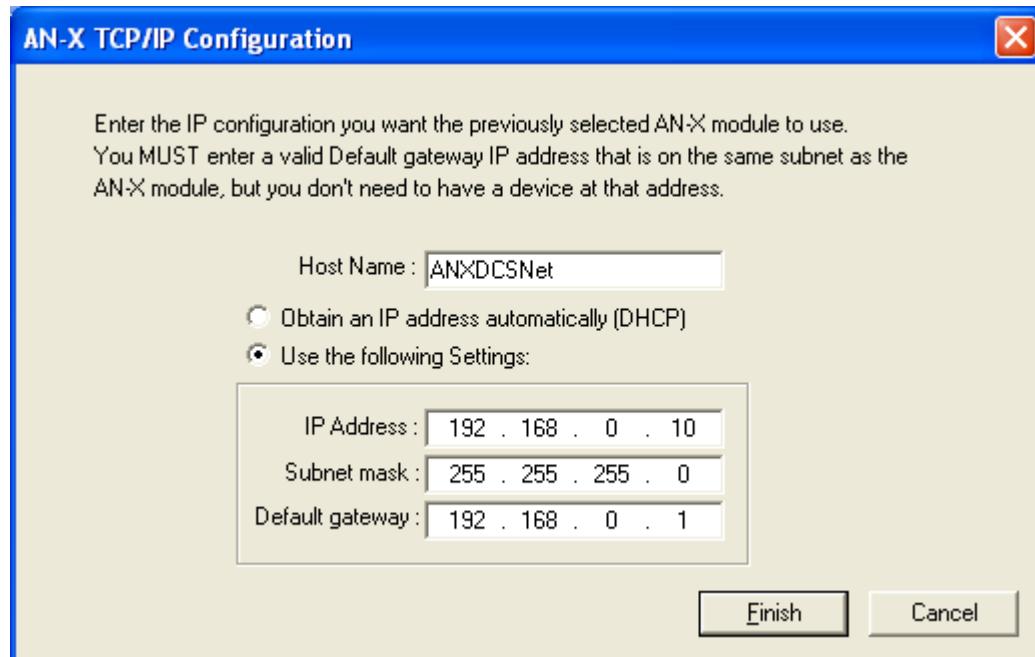
Step 3:

If you powered off the AN-X, turn it back on. Wait for AN-X to enter boot mode. While AnxInit is waiting, the *Next >>* button is disabled. When AN-X is in boot mode, the *Next >>* button is enabled.



If the AN-X does not enter boot mode within about 10 seconds, return to the previous screens and check the entries.

The *AN-X TCP/IP Configuration* dialog appears.



Enter a *Host Name* for the AN-X. This name is used internally by AN-X and may be used to identify the AN-X if you have a DNS server on your network. The name can be from 1 to 31 characters long.

To configure the AN-X to obtain its IP address from a DHCP server on the network, select *Obtain an IP address automatically (DHCP)*

To configure the AN-X to use a static IP address, select *Use the following Settings* and enter:

- the desired IP address for the AN-X.
- the Subnet mask for the AN-X
- the default gateway for your network.

You must enter a valid default gateway address even if there is no device at the gateway address on the network.

Click OK to complete the configuration.

If you Cancel the *Configuration/AN-X IP Settings* command, AN-X is left running the boot code. Use the *Utilities/Rerstart AN-X* command to restart the AN-X.

You can also reconfigure the AN-X IP parameters from the web interface. Refer to page 66.

Example: Standalone Computer

A typical example is a laptop computer running the AutoMax programming software and connecting directly to an AN-X to program an AutoMax processor.

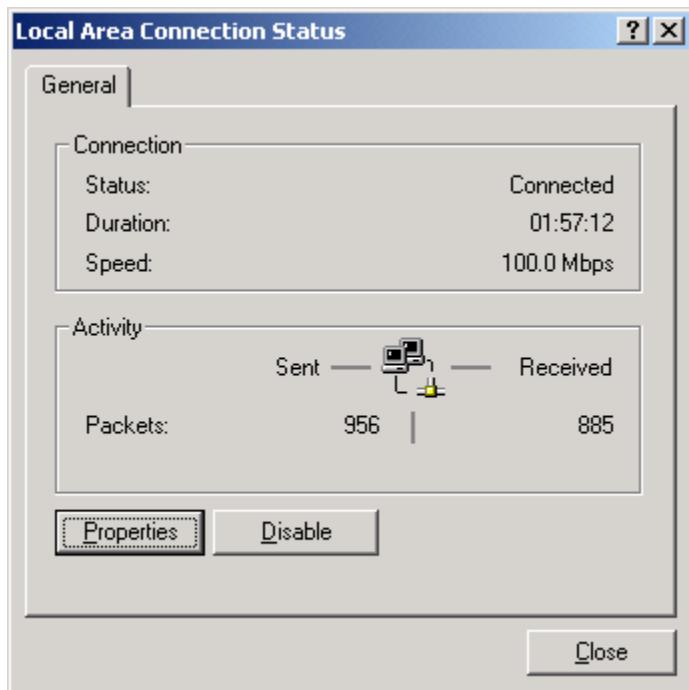
Since you are connecting directly from the computer to AN-X, use a crossover Ethernet cable.

The following instructions assume Windows 2000. The procedure for Windows NT and Windows XP is very similar. They also assume that an Ethernet network card has been installed in the computer and that AnxInit has been installed on the computer.

TIP

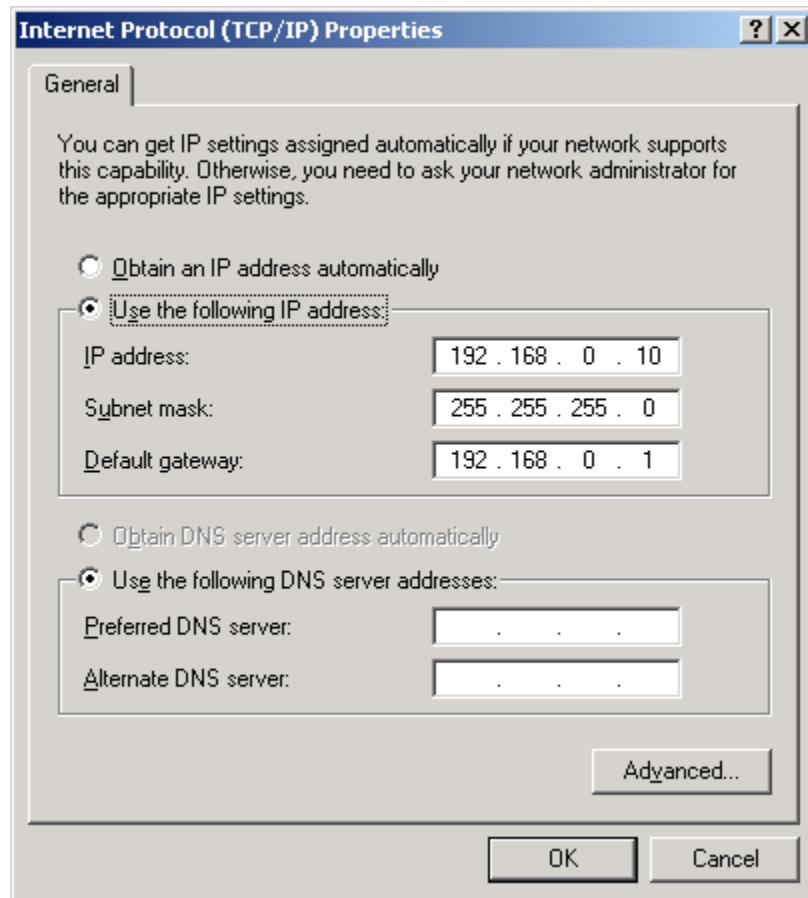
The parameters in this example will work when you set up any standalone computer to work with AN-X.

First configure the computer to use a static IP address. From the Start menu, select *Start/Settings/Network and Dialup Connections*. Double click on *Local Area Connection*.



Click the *Properties* button.

Double click on *Internet Protocol (TCP/IP)*.



In this example, we will assign the computer an IP address of 192.168.0.10

Set the Subnet mask to 255.255.255.0 (standard mask for the Class C network address of 192.168.0.x).

Set the Default gateway to 192.168.0.1 (this address does not exist on the Ethernet network but AN-X requires a valid default gateway entry).

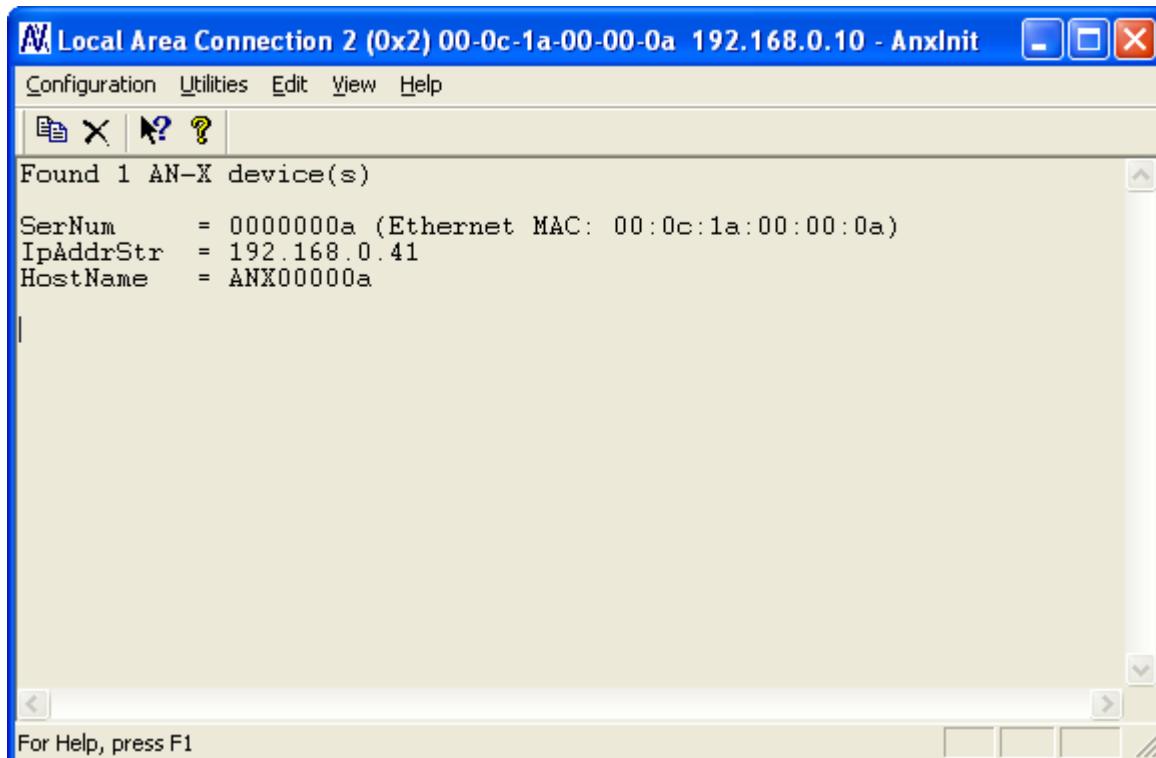
Click OK to accept the settings

Connect the computer to AN-X using the crossover cable.

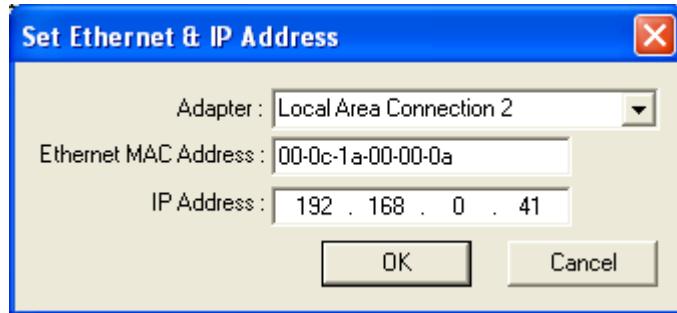
If this is the first time you have used the AN-X module, it will look for a DHCP server on the network. It waits about three minutes, then reverts to a default IP address of 192.168.0.41

Power up the AN-X and wait for the search for a DHCP server to time out. When the search for a DHCP server times out, AN-X will flash the SYS LED red three times followed by a pause repeatedly.

Run AnxInit. Select *Utilities/Locate All AN-X Modules* and confirm that the AN-X is found.

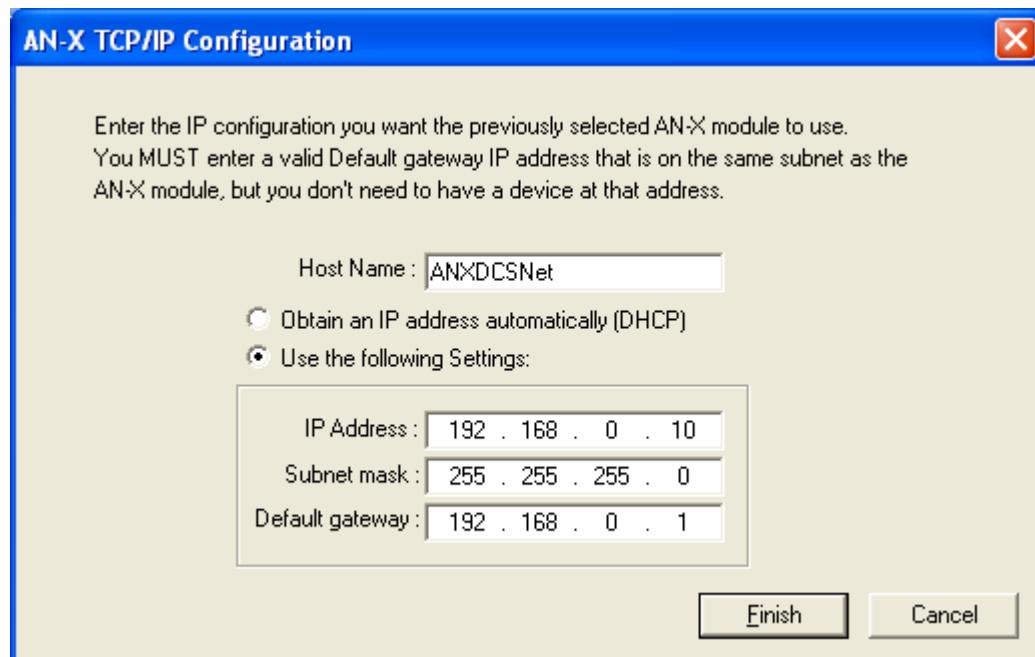


Select *Utilities>Select An AN-X* and enter the MAC Address and IP address.



Click *OK* to accept the setting.

Select *Utilities/AN-X IP Configuration*.



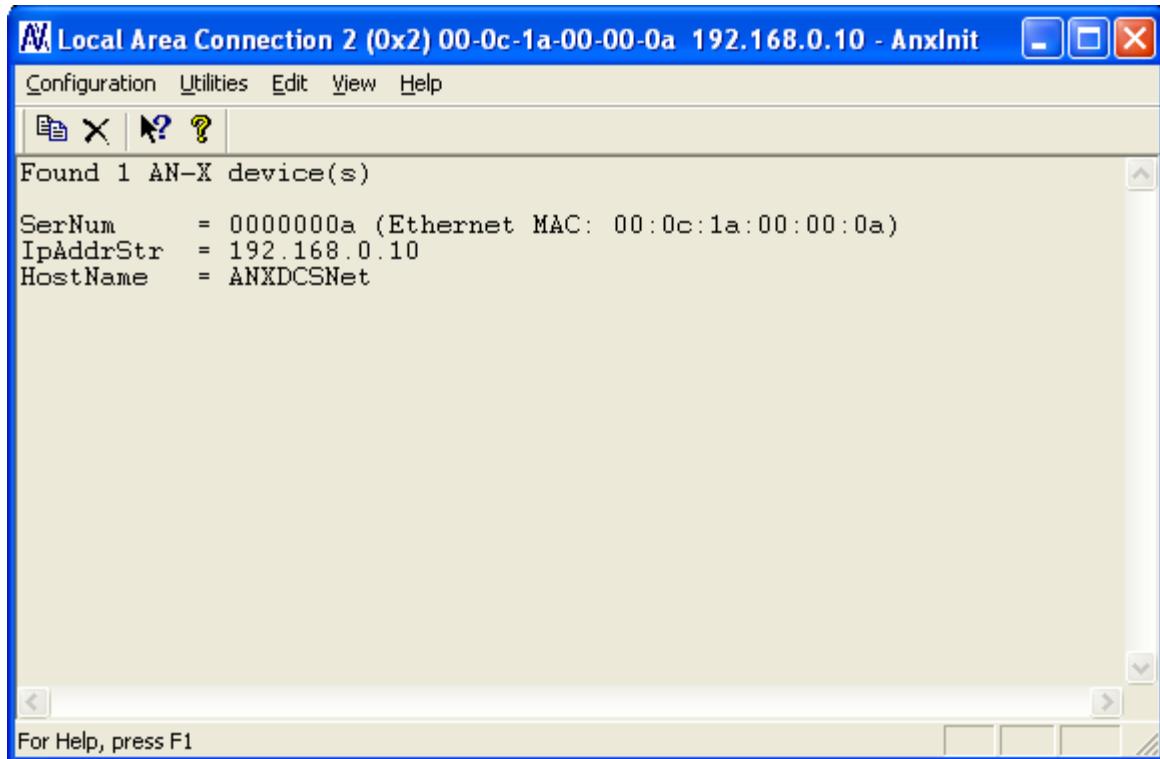
Enter an IP Address. In this case we chose 192.168.0.10

Enter the same Subnet mask and Default gateway that you entered for the computer. The default gateway address does not exist on the network but AN-X requires that the field have a valid entry.

Click *Finish* to accept the settings.

Select *Utilities/R*estart AN-X to restart AN-X with the new parameters.

When the AN-X has restarted (SYS LED is solid green), select *Utilities/L*ocate All AN-X Modules and confirm that the AN-X is found with the new parameters.



Reconfiguring an AN-X from an Unknown State

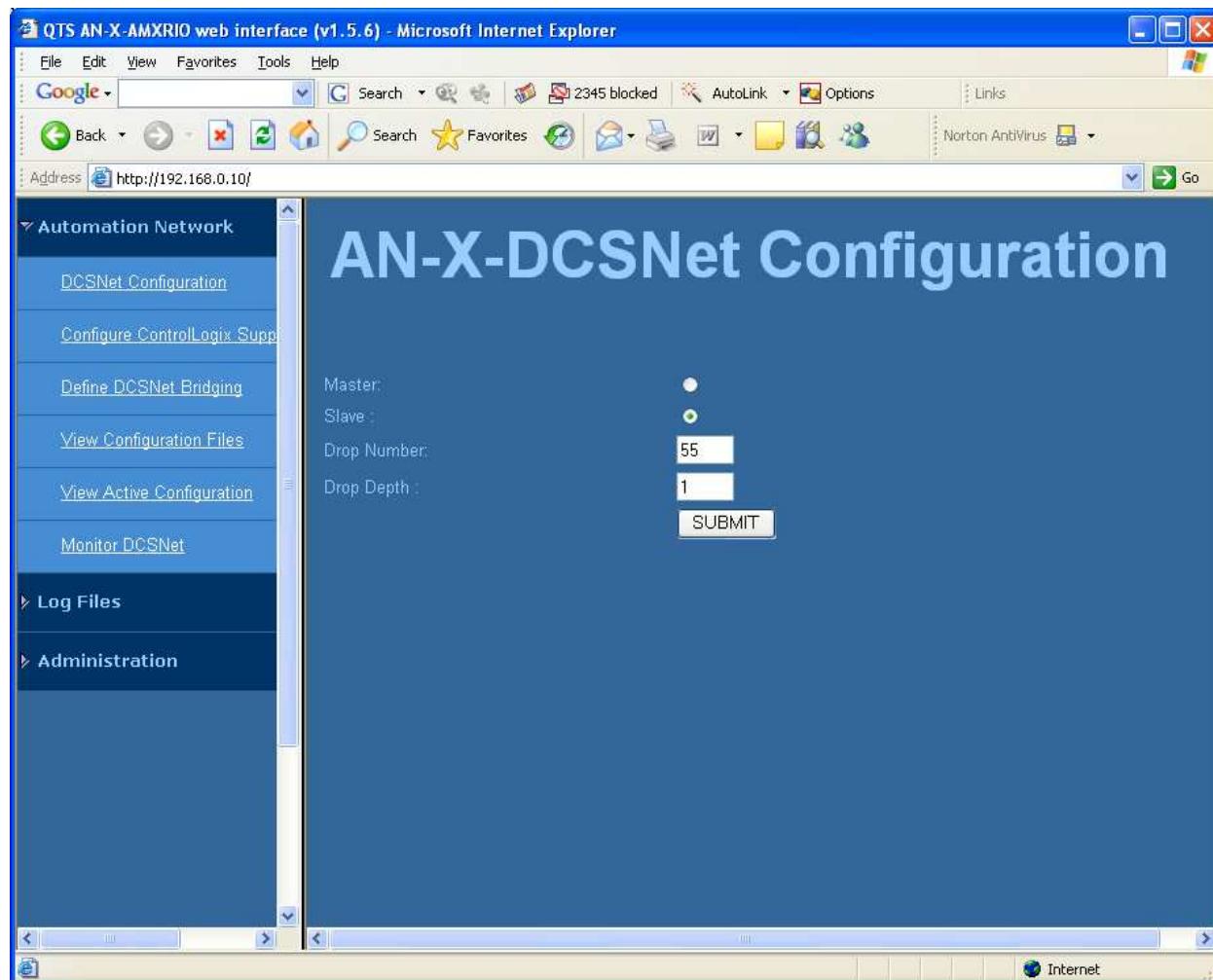
It sometimes happens that an AN-X has been previously configured with an IP address that causes it to be inaccessible on the current Ethernet network. To reconfigure it to a known state, run the command *Configuration/AN-X IP Settings* to start the AN-X IP Configuration Wizard and reconfigure the AN-X.

DCSNet Configuration

You set the DCS mode of operation (master or slave) and the drop number and depth using the web interface.

Start your web browser and enter the AN-X IP address as the address.

Select *Automation Network/DCSNet Configuration* to set the DCS drop number and depth.



AN-X-DCSNet can be used as a DCS master or slave. Check *Master* or *Slave* to select which one you want.

If the AN-X-DCSNet is a DCS slave, enter the Drop Number and Drop Depth. These entries are ignored if the AN-X is a DCS master.

Click the SUBMIT button to send the values to AN-X.

AN-X defaults to DCS slave operation with drop number 55 and drop depth 1.

For further details, refer to page 59.

Using the AutoMax Programming Software

Any computer with Ethernet access can use an AN-X-DCSNet module to connect to an AutoMax processor over DCSNet.

AN-X offers fast access to the DCS network and does not require a specific format (ISA, PCI, etc.) interface card. AN-X-DCSNet works with any computer than can connect to Ethernet.

The following instructions assume that:

- AN-X has been configured and is active on the Ethernet network
- AN-X has been connected to the DCS network
- the AN-X DCS drop number and drop depth have been assigned (see page 59)

To use AN-X-DCSNet with the AutoMax Programming Executive, you must complete the following steps:

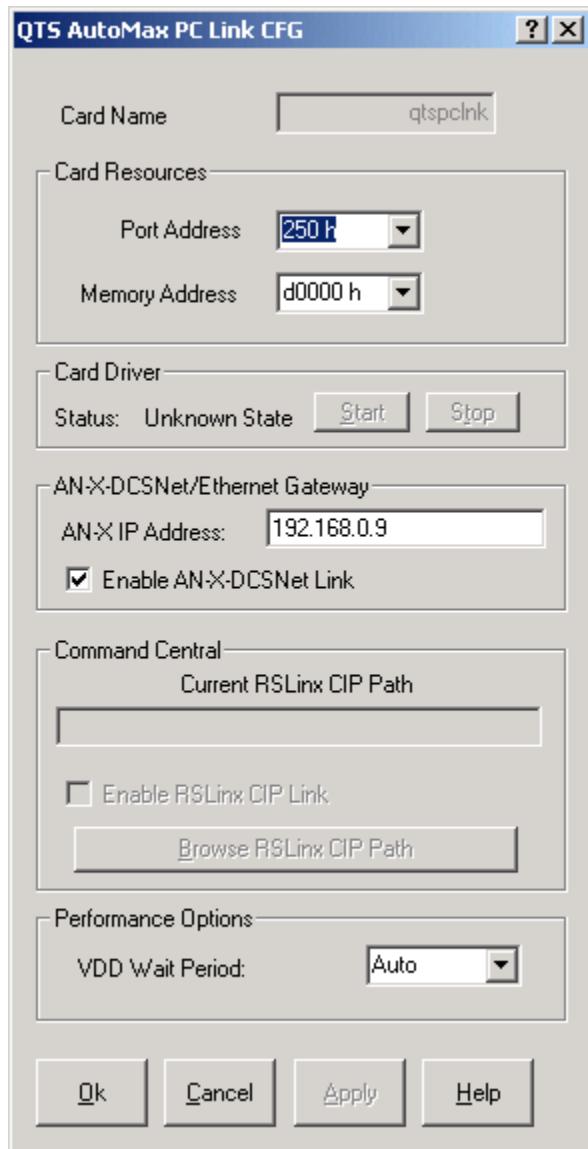
1. Install and configure the Virtual Device Driver (VDD)
2. Configure the programming software to use AN-X

Requirements

- Virtual Device Driver (VDD) version 3.1.0.4 or above, available on the AN-X distribution CD
- AutoMax Programming Executive 3.9 or 4.3 or above

Installing and Configuring the VDD

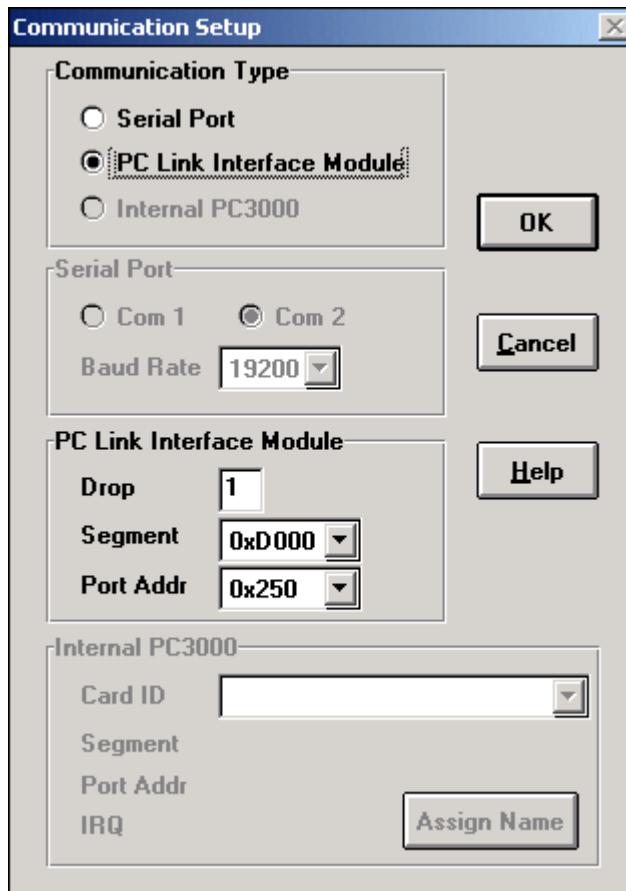
1. Install the virtual device driver. Insert the AN-X distribution CD that contains the Virtual Device Driver and install it.
2. Run the Control Panel Applet (Start/Control Panel/QTS PC Link Card Configuration and set the Port Address and Memory Address. You can leave them at their default values.
3. Check *Enable AN-X-DCSNet Link*
4. Enter the IP address of the AN-X in the *AN-X IP Address* field. If you do not know the IP address, use *Utilities/Locate All AN-X Modules* in AnxInit (see page 47) to find it.
5. Click OK.



Configuring the Programming Software

To configure the AutoMax Programming Executive to use AN-X:

1. Run the Programming Executive
2. Select *Setup/Communications*. The Communications Setup dialog appears.



3. Set the *Communications Type* to PC Link Interface Module.
4. Set the *Drop* to match the AN-X drop number on DCS
5. Set the *Segment* to match the Memory Address in the VDD Configuration.
6. Set the *Port Addr* to match the Port Address in the VDD configuration.
7. Click *OK* to complete the configuration.

You should now be able to go online with the AutoMax Programming Executive.

Multiple Programmer Access

The AutoMax operating system uses the source of programming messages (direct connection to the serial port or drop number on DCSNet) to distinguish between programmers. It uses the identity of each programmer to manage levels of access (None, Data, Task) and to return requests for data to the programming devices. The AutoMax operating system controls the operations that programming device can perform, depending on their access level.

If multiple copies of the Programming Executive attempt to program an AutoMax through the same AN-X-DCSNet, the AutoMax sees them as a single user since they are all connected using the drop number of the AN-X-DCSNet.

This causes the following anomalous behavior in the programming devices:

- variables, I/O and ladder logic may be displayed incorrectly since the same data is sent to all devices connected to the same AN-X-DCSNet
- each Programming Executive connected through the same AN-X-DCSNet receives the same access level. If you change the access level on one, the AutoMax operating system changes to the same level on all of them. This defeats the built-in access management in the AutoMax.

Each copy of the Programming Executive should communicate with the AutoMax using a different AN-X-DCSNet to ensure that the AutoMax operating system can properly detect them as separate copies of the Programming Executive. Multiple copies of the Programming Executive should NOT be connected through the same AN-X-DCSNet. Each programmer should use a separate AN-X.

Connecting to a Different AN-X

If you have more than one AN-X on the Ethernet network, each connected to a different DCS network, to change the AN-X your programming software is using, run the Control Panel Applet (*Start/Control Panel/QTS PC Link Card Configuration* and change the IP address in the *AN-X IP Address* field.

If you do not know the IP address, use *Utilities/Locate All AN-X Modules* in AnxInit (see page 47) to find it.

Scheduled Data with a ControlLogix

AN-X-DCSNet can exchange scheduled data with a ControlLogix processor.

It supports:

- up to 248 registers of output data
- up to 250 registers of input data
- up to 250 registers of status input data

The terms input and output are from the point of view of the ControlLogix processor.

The ControlLogix sends output data to the AN-X-DCSNet and the AN-X sends it out on the DCS network. You create a configuration file to define where on DCSNet the ControlLogix data is sent.

If the AN-X is a DCS master, allowed output data includes registers 32 to 39 on drop 0 (broadcast data) and registers 32 to 63 on drops 1 to 55 . If the AN-X is a DCS slave, allowed output data includes registers 0 to 31 on any drops (1 to 55) that are included in the AN-X drop number and drop depth.

The AN-X sends input data and status input data to the ControlLogix. The configuration file defines which DCSnet data is sent to the ControlLogix. There are no restrictions on which DCS registers can be mapped to ControlLogix input or status input data.

Connections

There are two possible types of scheduled connections from the ControlLogix processor to the AN-X-DCSNet:

- Exclusive owner connections, which contain input, output and possibly status input data
- Input-only connections, which contain input and possibly status input data

Only the exclusive owner connection can write data to AN-X and to DCSNet.

There can be only one exclusive owner connection to an AN-X module. There can be more than one input only connection to an AN-X.

Configuration

Configuring the scheduled data exchange consists of:

1. Configuring AN-X in RSLogix 5000
2. Selecting which DCS data is mapped to the scheduled data and saving it as a comma separated variable (CSV) file

3. Sending the configuration to AN-X

Requirements

- RSLogix 5000 version 12 or above
- ControlLogix processor with firmware version 12 or above
- 100 Mbit Ethernet network and ENBT modules. We strongly recommend using switches rather than hubs

Reference

Allen-Bradley publication *EtherNet/IP Media Planning and Installation Manual*, publication ENET-IN001A-EN-P

WARNING!

Do not use the web interface to monitor data on the AN-X-DCSNet while the AN-X is exchanging scheduled data with a ControlLogix processor in a production environment.

Configuring AN-X in RSLogix 5000

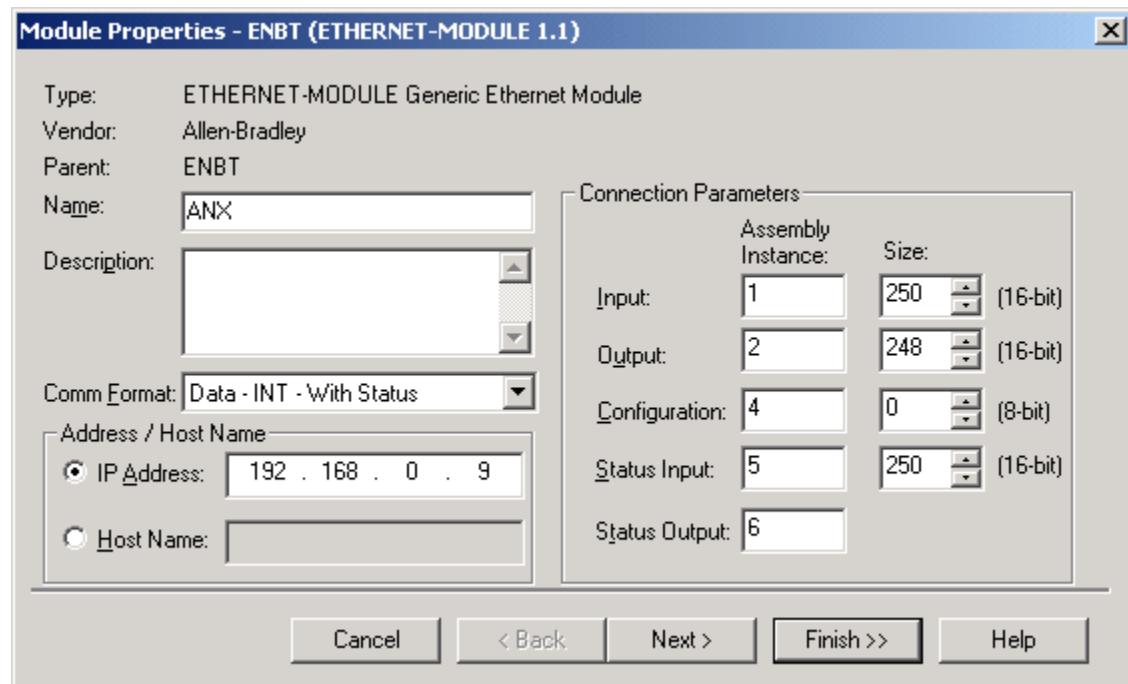
You configure the module in RSLogix 5000 to set the module type, how much scheduled data to transfer and how often to transfer it.

There can be a maximum of 248 words of output data and 250 words each of input and status input data.

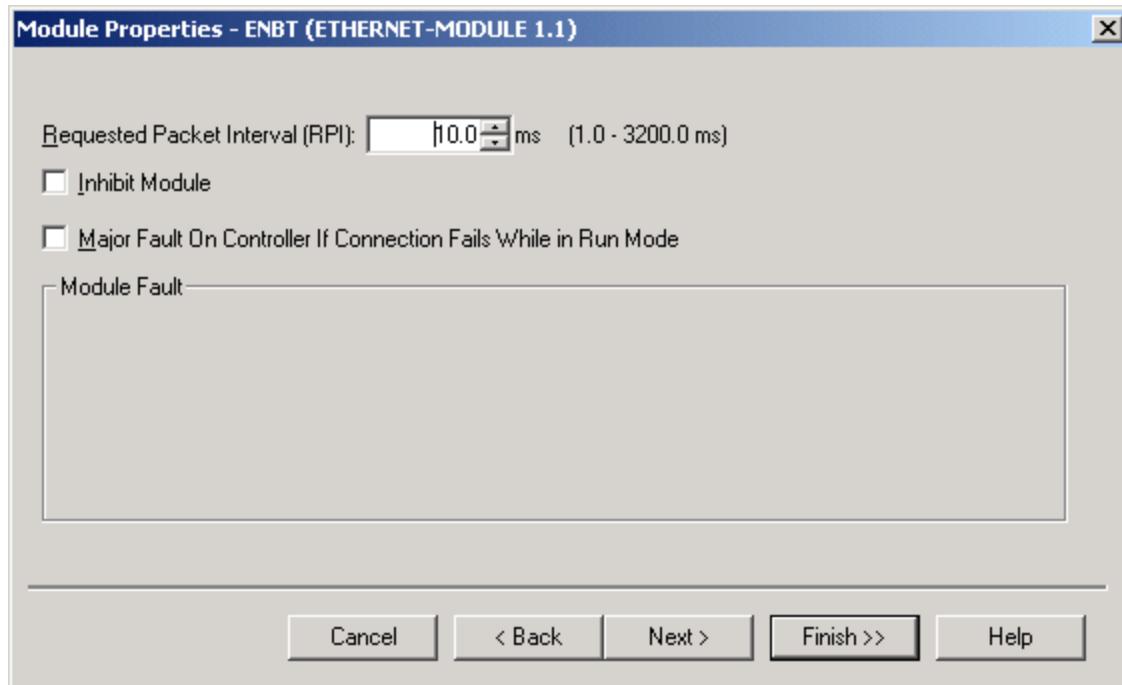
If the total amount of input data you wish to pass from DCSNet is 250 registers or fewer, you can map all the data to the input data and do not need to create the status input data. This will use less Ethernet bandwidth. In the following, to create input and status input data, select Data –INT – with Status as the Data Format. To create just input data, select Data – INT.

To configure the module in RSLogix 5000, you must be offline.

1. If you are creating a new project, select File/New to create a new project, give the processor a name, and enter the slot it occupies in the ControlLogix rack.
2. Right click on I/O configuration and select New Module...
3. Select a module of Type ETHERNET-MODULE, Description Generic Ethernet Module from the list and Click OK. RSLogix 5000 displays the *Module Properties* dialog box.



4. Assign the module a *Name* and optionally a *Description*.
5. Set the *Comm Format* to Data – INT – with Status (or Data – INT).
6. Set the *IP Address* to match the address of the AN-X module.
7. Set the *Input Assembly Instance* to 1. Normally you set the size to the maximum allowed, 250 words. You can set it to a smaller value but it should be large enough to allow all the mapped data to pass.
8. Set the *Output Assembly Instance* to 2. Normally you set the size to the maximum allowed, 248 words. You can set it to a smaller value but it should be large enough to allow all the mapped data to pass.
9. Set the *Configuration Assembly Instance* to 4. The size should be 0.
10. Set the *Status Input Assembly Instance* to 5. Normally you set the size to the maximum allowed, 250 words. You can set it to a smaller value but it should be large enough to allow all the mapped data to pass. If the Comm Format is Data – INT, the status input and status output are grayed out.
11. Set the *Status Output Assembly Instance* to 6. You cannot set the size.
12. Click *Next >* to display the second Module Properties dialog box



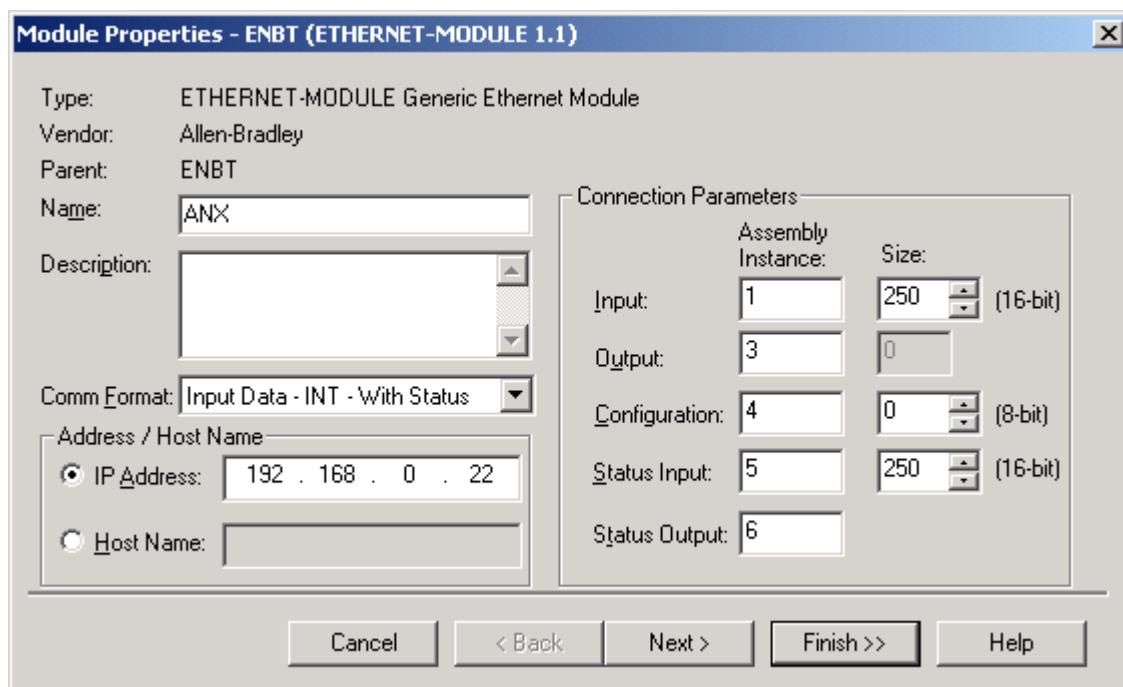
Connection Parameters

13. Set the module RPI. This is how often the module's scheduled data is updated in the processor. The value can range from 5.0 to 3200.0 ms.
14. Click *Finish >>* to complete the module configuration.

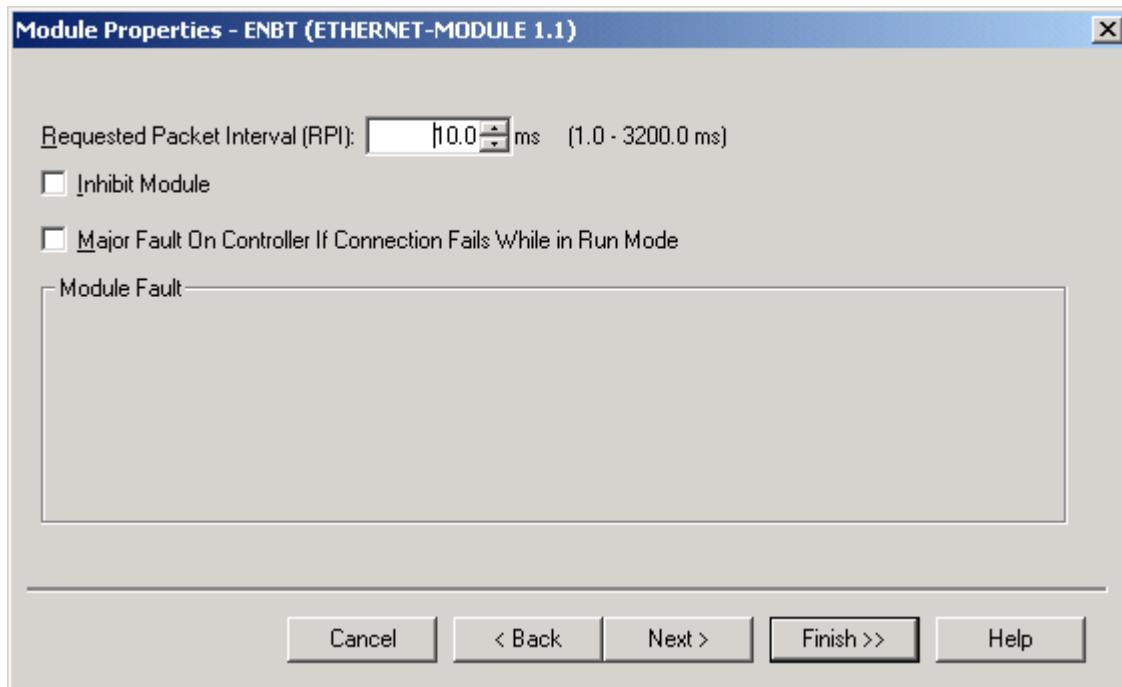
Configuring Input-Only Connections

In a ControlLogix system, multiple processors can receive inputs from a module. Only one processor can control the outputs. To configure an input-only connection to the AN-X module:

1. Right click on I/O configuration and select *New Module...*
2. Select a module of Type 1756-ETHERNET, Description Generic Ethernet Module from the list and click OK. RSLogix 5000 displays the Module Properties dialog box.



3. Assign the module a *Name* and optionally a *Description*.
4. Set the *Comm Format* to Input Data – INT – With Status (or Input Data – INT).
5. Set the *IP Address* to match the IP address of the AN-X module.
6. Set the *Input Assembly Instance* to 1. Normally you set the size to the maximum allowed, 250 words. You can set it to a smaller value but it should be large enough to allow all the mapped data to pass. If there is also an exclusive owner connection, then the size should match the exclusive owner size.
7. Set the *Output Assembly Instance* to be 3. You cannot set the size.
8. Set the *Configuration Assembly Instance* to 4. Set the size to 0.
9. Set the *Status Input Assembly Instance* to 5. Normally you set the size to the maximum allowed, 250 words. You can set it to a smaller value but it should be large enough to allow all the mapped data to pass. If there is also an exclusive owner connection, then the size should match the exclusive owner size.
10. Set the *Status Output Assembly Instance* to 6. You cannot set the size.
11. Click *Next >* to display the second Module Properties dialog box.



Connection Parameters

12. Set the module RPI. This is how often the module's scheduled data is updated in the processor. The value can range from 5.0 to 3200.0 ms.
13. Click *Finish >>* to complete the module configuration.

All connections to the AN-X module must have the same lengths and RPIs.

Selecting the RPI

When you create an exclusive owner or input only connection to the AN-X-DCSNet, you must enter a requested packet interval (RPI), the period at which the data updates.

Consider the DCS network update rate when selecting a value. The approximate DCS network update time is 3 ms per drop.

There's no point in setting the RPI to be much faster than the DCSNet update time. AN-X will just resend the same data and add to the Ethernet traffic.

The DCS network update time is given by:

Update time = (DropTime * N) + NewDropTestTime + MessageTime
where

DropTime = the amount of time for a master to send a message and the slave to respond = 2.99 ms

N = Number of slave drops (physical and virtual)

NewDropTestTime = amount of time for the master to poll an inactive drop and wait for its response = 2.48 ms assuming no response

MessageTime = amount of time to transfer programming terminal messages. If the master is sending a message, this is 2.09 ms. If a slave is sending a message, this is 3.395 ms.

Example:

A network composed of 10 drops which is not messaging will update each drop with a period of:

$$\text{UpdateTime} = 2.99 * 10 + 2.48 = 32.38 \text{ ms}$$

Mapping the DCS Data

You define the DCS data that is exchanged between the AN-X and the ControlLogix processor in a comma-delimited text file, which can be created using a spreadsheet such as Excel or a text editor.

Module Name

The first line in the file is the module name, used to create tags that can be imported into RSLogix 5000.

The first field contains the keyword ClxExp. The second field contains the name you gave the module when you configured it in RSLogix 5000.

Example:

ClxExp, ANX

I/O Data

This file has three sections, one for output data, one for input data, and one for status input data. The sections are identified by a line that consists of a keyword, either “DataOutput”, “DataInput” or “StatusInput”.

Each section can contain up to 64 data definition entries. Each entry consists of an offset in the section, a drop number, a register, a length and an optional tagname.

If the offset is omitted, AN-X assigns the offset based on the previous data.

If the tagname is omitted, AN-X creates a default tagname based on the drop number and register.

For example, the entry

200,4,0,10, Test

maps 10 registers starting at drop 4, register 0 to offset 200 in the current section and assigns the tagname Test.

The maximum size for each section is 250 input registers, 248 output registers and 250 status input registers.

Anything after a semicolon on a line is treated as a comment and is ignored. You can use this to document the file by adding comments to the ends of lines or as separate lines.

Input Data

The input data section begins with a line that starts with the keyword DataInput.

This is followed by up to 64 mappings, of the form

Offset (optional), drop, register, length, tagname (optional)

where the offset is the offset into the ControlLogix input data, the drop and register are the DCS drop number and starting register where the data will be obtained and length is the number of registers.

For example,

10,0,14,6, Diagnostics

is a mapping that takes 6 registers of DCS data starting at drop 0 register 14 (diagnostic counters) and maps them to ControlLogix input data at offset 10.

Output Data

The output data section begins with a line that starts with the keyword DataOutput.

This is followed by up to 64 mappings, of the form

Offset (optional), drop, register, length, tagname (optional)

where the offset is the offset into the output data, the drop and register are the DCS drop number and starting register where the data will be written and length is the number of registers.

For example,

200,1,5,3, Tagname

is a mapping that takes 3 registers from the ControlLogix output data at offset 200 and writes them to 3 DCS registers starting at drop 1 register 5.

If the AN-X-DCSNet is a DCS slave, the only valid entries are DCS registers 0-31 on drops included in the AN-X drop number and drop

depth. For example, if the drop number is 7 and the depth is 3, only drops 7, 8, and 9 can be used in output data mappings.

If the AN-X is a DCS master, the valid entries are registers 32-63 on drops 0 to 55.

The ControlLogix connection run/idle header can also be mapped to an output register. The form of this mapping is

Run, drop, register

The value is 1 if the ControlLogix is in run mode and 0 if it is in program mode.

Status Input Data

The status input data section begins with a line that starts with the keyword **StatusInput**.

This is followed by up to 64 mappings, of the form

Offset (optional), drop, register, length, tagname (optional)

where the offset is the offset into the ControlLogix status input data, the drop and register are the DCS drop number and starting register where the data will be obtained and length is the number of registers.

For example,

0,0,32,8, Broadcast

is a mapping that takes 8 registers of DCS data starting at drop 0 register 32 (broadcast data) and maps them to ControlLogix status input data at offset 0.

Sample File

The following sample file shows how data is mapped for an AN-X configured as a DCS slave at drop 1, depth 2. The AN-X is also monitoring all the data on drop 3 on the same network.

```
;Sample AN-X-DCSNet ControlLogix configuration
; AN-X module is a DCS slave, drop 1, depth 2
ClxExp, ANX
DataInput
0,1,32,32, Drop1Outputs ; Drop 1 registers 32-63 from the AutoMax
32,2,32,32, Drop2Outputs ; Drop 2 registers 32-63 from the AutoMax
64,0,32,8, Broadcast ; Broadcast data from the AutoMax
DataOutput
```

```
0,1,0,32 , Drop1Inputs ; Drop 1 registers 0-31 from the AN-X to the
AutoMax

32,2,0,32, Drop2Inputs ; Drop 2 registers 0-31 from the AN-X to
the AutoMax

StatusInput

0,0,14,6, Diagnostics ; Diagnostic drop 0 registers on the AN-X

6,3,0,64 , Drop3Registers ; Monitor Drop 3 registers 0-63
```

Sending the Configuration to AN-X

When the configuration is complete, save it to a file. If you are using a spreadsheet to create the configuration, save it as a file of type comma separated variable (CSV).

To upload the configuration:

1. Start your web browser
2. Enter the AN-X IP address as the address, for example, 192.168.0.10
3. Select *Automation Network/Configure ControlLogix Support*
4. Browse or type in the configuration file name
5. Click *Send To AN-X*

The web interface displays the result of the upload, either success or an error message. To see further details, select *Log Files/ControlLogix Log* (see page 65) and check for error messages.

Viewing the Current Configuration

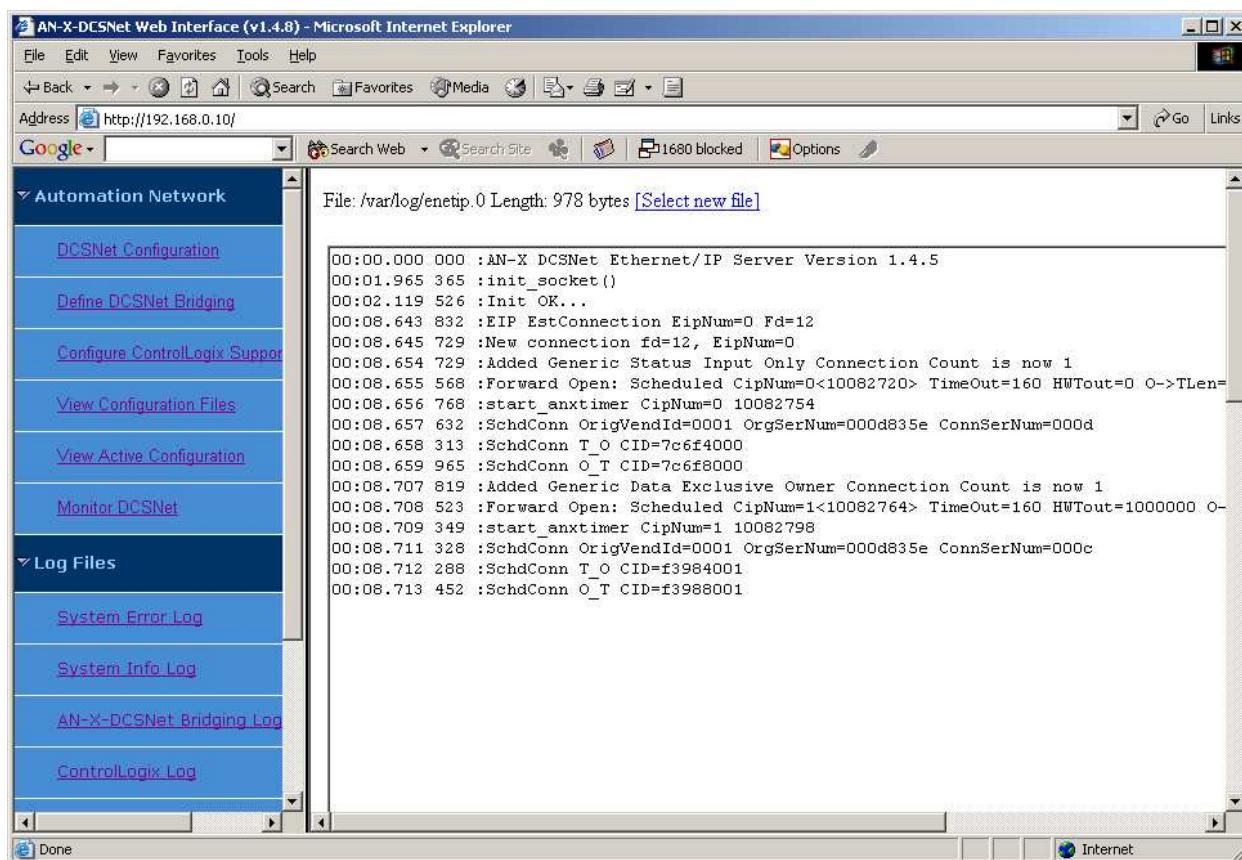
To view the configuration in an AN-X module, access the AN-X using the web interface, and select *Automation Network/View Configuration Files*. Click on the link *AN-X-DCSNet ControlLogix (Ethernet/IP) Configuration File*.

To save the configuration to a file on your computer, right click on the link and save the target to a file.

Error Log

Errors that occur during configuration of scheduled data or during operation of scheduled data or unscheduled messaging are logged in the AN-X.

You can view the log using the AN-X web interface. Select *Log Files/ControlLogix Log* to view the log.



If the log overflows, AN-X closes the log file (enetip.0) and opens a second log file (enetip.1) and continues to alternate between the two log files as each one fills up. Use View All Logs to view both log files.

Exporting Tags from AN-X

AN-X uses the Ethernet/IP configuration to create tags that can be imported into RSLogix 5000. Use these tags in your RSLogix 5000 program to access the data on the AN-X.

In the web interface, select *Automation Network/View Configuration Files*.

There are two sets of tag files, one for exclusive owner connections and one for input only connections.

To view the files, click on either *AN-X-DCSNET Ethernet/IP ControlLogix Exclusive Owner Data Tags* or *AN-X-DCSNET Ethernet/IP ControlLogix Input Only Data Tags*. To save the file to your computer, right click on the link and select *Save Target As...*

To import the tags into RSLogix 5000, you must be offline. Select *Tools/Import Tags* and import the tag file.

Using RSLogix 5000 to Diagnose Problems

You display the Module Properties dialog by right clicking on the module while online with RSLogix 5000. This may help diagnosing some problems, especially connection errors.

The following information is based on version 12.00 of RSLogix 5000.

General Tab

The *Type* should be ETHERNET MODULE Generic Ethernet Module

The *Vendor* should be Allen-Bradley (since it's configured as a generic module)

The name and description are whatever you set when you configured the module.

Comm Format, *IP Address* and *Connection Parameters* should match what you set when you configured the module.

Connection Tab

The *Inhibit Module* checkbox inhibits the module. It should not be checked for normal operation.

The *Major Fault on Controller if Connection Fails While in Run Mode* checkbox causes the module to fault the processor if the connection between the ControlLogix processor and the module fails.

If there are any problems connecting to the AN-X-DCSNet module, there will be an error message in the module fault area.

AN-X to AN-X Communication

An AN-X-DCSNet module can be configured to exchange data with other AN-X modules on the Ethernet network.

Each AN-X can produce up to 10 blocks of data. Each block can contain up to 700 16-bit registers. You map DCS registers to the produced blocks in a spreadsheet, then upload the configuration to the AN-X using the web interface.

Produced data blocks can update:

- at timed intervals, from 5 to 16383 ms.
- at the end of a DCS network scan
- when the broadcast data updates

The true update rate may be restricted by the available bandwidth of your Ethernet network.

Each AN-X can consume up to 10 blocks of data produced by other AN-X modules. Each consume block has an associated timeout that can range from 5 to 16383 ms. If the consume block is not updated within the timeout period, AN-X logs a timeout event.

AN-X to AN-X communication can be used to pass data from one DCS network to another using two AN-X-DCSNet modules or to pass data from a DCS network to a dissimilar network using an AN-X module for the other network.

You configure all AN-X modules on the Ethernet network with a single configuration file.

There is no limit on the number of AN-X modules that can consume the data that an AN-X produces.

Configuration File Format

The configuration file is a comma-separated variable (*.csv) text file. You can create it with a text editor or a spreadsheet such as Excel.

The configuration file consists of several sections

- configuration ID
- module_ip, identifies each AN-X being configured
 - produce, defines produced data for that AN-X
 - up to 10 produce blocks
 - consume, defines consumed data for that AN-X
 - up to 10 consume blocks

Configuration ID

The configuration_id line defines a 32 bit unsigned integer configuration ID for the configuration, and specifies whether the AN-X to which the configuration is uploaded should enable or disable execution of the configuration.

The purpose of the configuration ID is to ensure that all AN-X devices are using the same configuration. When an AN-X produces a block of data, it includes the configuration ID with the data. If an AN-X consuming the data does not have a matching configuration ID, it ignores the data and logs an error in the bridging log. Select *Log Files/Bridging Log* to view the log.

The second parameter in the configuration_id line determines whether AN-X to AN-X communication is enabled or disabled. Possible values are “enable” or “disable”.

Examples:

configuration_id, 1, enable

configuration_id, 2047, disable

Module Definition

The module_ip line begins the definition of the produced and consumed data for an AN-X. It consists of the keyword “module_ip”, followed by a comma and then the AN-X IP address.

Example:

module_ip, 192.168.0.41

The module_ip line is followed by a produce section and a consume section for the AN-X.

Produce Section

The produce line marks the start of the produced data for an AN-X. It consists of a comma, followed by the keyword “produce”

Example:

, produce

Produce Blocks

Each AN-X can have up to 10 blocks of produced data. The produce block can be up to 700 registers long. It can span multiple drops.

The block_id line marks the beginning of the definition of a block of produced data. The format of the block_id line is

, , block_id, blocknumber, update_type, update_time

The blocknumber can be from 1 to 10.

The update type can be:

Type	Description
Timed	block updates at regular timed intervals. The type is followed by an update time in milliseconds, from 5 to 16383 ms.
Bus_scan	block updates at the end of a DCS scan
Broadcast_data	block updates when broadcast data updates. This update type is valid only if the AN-X-DCSNet is a DCS slave

Some examples:

, , block_id, 1, timed, 100
, , block_id, 10, bus_scan
, , block_id, 5, broadcast_data

The block_id line is followed by from 1 to 64 data definition lines that specify the contents of the produce block. The format is

, , offset (optional), tagname, data operation, count, drop, register

The offset is the byte offset in the produce block. It can range from 0 to 1399, but the upper limit also depends on the data type. For example, the maximum offset for data type U16 (see below) is 1398.

The offset is optional but if it is included it defines the location of the item in the produce block. Subsequent items with no offset in the definition are allocated after the item with the offset. For example, if you assign an offset of 1320 to an item with type U8, count 1, the next item (with no explicit offset) is automatically assigned offset 1321.

TIP

Don't use offsets unless necessary. AN-X will assign all data locations automatically, based on the tagnames. If you add data later, you won't have to make any changes.

The tagname can have from 1 to 47 alphanumeric characters. It has to start with a letter or an _ (underscore). It cannot include spaces or punctuation (especially commas). Consume blocks use the tagname to identify the start of a specific piece of data.

Tagnames must be unique within a produced block.

The data operation describes how the item is processed when it is transferred to the produced block. The data operation can be one of the following:

Operation	Description
U16	Copy two bytes to two bytes
U16_SW	Copy and swap and two bytes to two bytes
U32	Copy four bytes to four bytes
U32_SW	Copy and swap four bytes to four bytes (first byte is copied to fourth byte, second byte is copied to third byte, etc)
U8_TO_U16	Copy one byte to two bytes, unsigned. The high byte of the destination is set to 0.
S8_TO_S16	Copy one byte to two bytes, signed. If the high bit in the source byte is set, the byte with the higher offset in the produce block is 0xff. Otherwise it is 0.
U16_TO_U8	Copy two bytes to one byte, unsigned, ignore the contents of the upper byte of the source.
U16_TO_U8_OV	Copy two bytes to one byte, unsigned. If the upper byte of the source is non-zero, clamp the destination at 255. For example if the first byte contains 00 and the second byte contains 01, the destination is set to 0xFF = 255 decimal.
S16_TO_S8	Copy two bytes to one byte, signed. If the source value is outside the range of an 8-bit signed integer (-128 to 127), the value is clamped at -128 or 127.

The count defines how many items of the data type are to be transferred to the produce block. The maximum value of the count is determined by the combination of the amount of data defined for the node and the data operation.

The drop can be any valid drop number from 0 to 55. The register can range from 0 to 63.

Some examples:

, , ,Broadcast,U16,8,0,32

, , ,Diagnostics,U16,7,0,14

, ,1399,Test,U16_TO_U8,1,0,4 ; with explicit offset

Consume Section

The consume line marks the start of the consume definitions for an AN-X. It consists of a comma, followed by the keyword “consume”.

Example:

, consume

Consume Blocks

Each AN-X can have up to 10 consume definition blocks. A consume block tells the consuming AN-X the source of the data (IP address and produce block number), the location of the data within the produced block and the amount of data to consume, how to process that data, and where to write the consumed data.

The destination DCS drop and registers must be writable by the AN-X that consumes the data. For example, if an AN-X is a DCS slave at drop 1 depth 2, it can write the consumed data only to drop 1 registers 0 to 31 and drop 2 registers 0 to 31.

The producer_ip line identifies the AN-X that is producing the data. The format is

, , producer_ip, IP address

Example:

, , producer_ip, 192.168.0.9

The block_id marks the beginning of the definition of a block of produced data. The format of the block_id line is

, , block_id, blocknumber, timeout

The blocknumber is the block number on the producing AN-X and can range from 1 to 10.

The timeout can range from 5 to 16383 ms. If the produced block does not update within the timeout period, AN-X logs an error in the bridging log. Select *Log Files/Bridging Log* in the web interface to view the log.

The block_id line is followed by from 1 to 64 data definition lines that specify the contents of the consume block. The format is:

, , offset (optional), tagname, data operation, count, drop, register

The offset is the byte offset in the produce block. The minimum offset is 0. The maximum offset is 1399 but also depends on the data operation.

NOTE: If the offset is included, it takes precedence over the tagname.

As an example of where an offset is sometimes useful, if a produce block produces a 16 bit value with a tag name, most consumers use the entire 16 bit value via the tag name, but one of the consumers that is interested in just the upper byte can obtain the upper byte using the offset.

The tagname can have from 1 to 47 alphanumeric characters. It has to start with a letter or an _ (underscore). It cannot include spaces or punctuation (especially commas).

AN-X uses the tagname to locate the produced data. The combination of producer IP address, block number and tagname (or offset) specifies the start of the data to be consumed.

The data operation can be one of the following

Operation	Description
U16	Copy two bytes to two bytes
U16_SW	Copy and swap two bytes to two bytes
U32	Copy four bytes to four bytes
U32_SW	Copy and swap four bytes to four bytes (first byte is copied to fourth byte, second byte is copied to third byte, etc)
U8_TO_U16	Copy one byte to two bytes, unsigned. The high byte of the destination is set to 0.
S8_TO_S16	Copy one byte to two bytes, signed. If the high bit in the source byte is set, the byte with the higher offset in the produce block is 0xff. Otherwise it is 0.
U16_TO_U8	Copy two bytes to one byte, unsigned, ignore the contents of the upper byte of the source.
U16_TO_U8_OV	Copy two bytes to one byte, unsigned. If the upper byte of the source is non-zero, clamp the destination at 255. For example if the first byte contains 00 and the second byte contains 01, the destination is set to 0xFF = 255 decimal.
S16_TO_S8	Copy two bytes to one byte, signed. If the source value is outside the range of an 8-bit signed integer (-128 to 127), the value is clamped at -128 or 127.

TIP

To obtain a data operation that isn't supported, use a combination of data operations, one in the produce and one in the consume. For example, to copy a single byte to the high byte of a 16-bit word, use a U8_TO_U16 to copy the byte to a word in the produce block, then use a U16_SW in the consume to extract the data.

The count defines how many items of the data type are extracted from the produce block.

The count can range from 1 to 32, since the maximum number of consecutive writable registers is 32.

The DCS drop number can be any valid drop from 0 to 55. The register can be any valid register from 1 to 63 and must be writable.

Some examples:

, , , Broadcast, U16, 8, 0,32

, , , Drop1_Reg, U16, 32, 1, 0

Sample Configuration File

In the following configuration, there are two AN-X modules.

- the AN-X at IP address 192.168.0.10 is producing a block of data every 100 ms. It is also consuming data from the AN-X module at IP address 192.168.0.180
- the AN-X at IP address 192.168.0.180 is producing one block of data every 50 ms and is not consuming any data

```
configuration_id,1,enable
module_ip,192.168.0.10
, produce
, , block_id, 1 ,timed, 100
, , , Broadcast, U16, 8, 0,32
, , , Diagnostics, U16,7, 0,14
, consume
, , producer_ip,192.168.0.180
, , block_id,1,1000
, , , Drop1_Reg, U16, 32, 1, 0

module_ip,192.168.0.180
, produce
, , block_id,1,timed , 50
, , , Drop1_Reg, U16, 64, 1, 0
```

Sending the Configuration to AN-X

When the configuration is complete, save it to a file. If you are using a spreadsheet to create the configuration, save it as a file of type comma separated variable (CSV).

To upload the configuration:

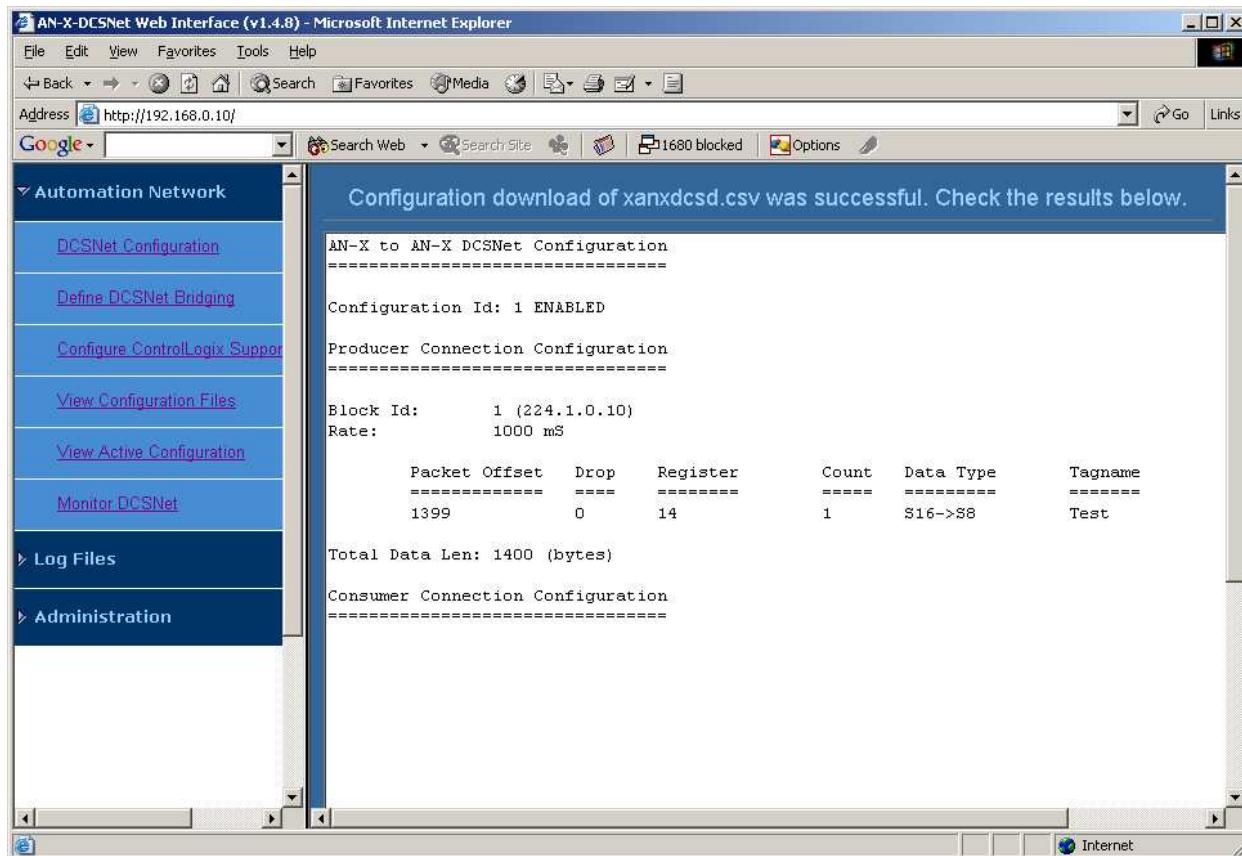
1. Start your web browser
2. Enter the AN-X IP address as the address, for example, 192.168.0.9
3. Select *Automation Network/Define DCSNet Bridging*
4. Browse or type in the configuration file name
5. Click *Send To AN-X*

If the upload is successful, the web interface shows the configuration. If an error occurs, the web interface gives an error message. To see further details, select *Log Files/AN-X-DCSNet Bridging Log* (see page 65) and check for error messages.

Error Log

Errors that occur during configuration of AN-X to AN-X communication or during operation are logged in the AN-X.

You can view the log using the AN-X web interface. Select *Log Files/AN-X-DCSNet Bridging Log* to view the log.



The screenshot shows a Microsoft Internet Explorer window with the title 'AN-X-DCSNet Web Interface (v1.4.8) - Microsoft Internet Explorer'. The address bar shows 'http://192.168.0.10/'. The left sidebar has a tree view with 'Automation Network' expanded, showing 'DCSNet Configuration', 'Define DCSNet Bridging', 'Configure ControlLogix Support', 'View Configuration Files', 'View Active Configuration', and 'Monitor DCSNet'. Below that is 'Log Files' and 'Administration'. The main content area displays a message: 'Configuration download of xanxdcsd.csv was successful. Check the results below.' It then shows 'AN-X to AN-X DCSNet Configuration' with 'Configuration Id: 1 ENABLED'. Under 'Producer Connection Configuration', it lists 'Block Id: 1 (224.1.0.10)' and 'Rate: 1000 mS'. A table follows:

Packet	Offset	Drop	Register	Count	Data Type	Tagname
1399		0	14	1	S16->S8	Test

Total Data Len: 1400 (bytes)

Consumer Connection Configuration

If the log overflows, AN-X closes the log file (xanxdcsd.0) and opens a second log file (xanxdcsd.1). It continues to alternate between the two log files as each one fills up. Use *View All Logs* to view both log files.

Using DDE/OPC to Access DCS Data on the Module

You can use a DDE or OPC server, such as RSLinx, to access the DCS data directly on the AN-X-DCSNet. The module "emulates" PLC-5 integer files 100-155. Each file corresponds to a DCS drop. For example, if you create tags to access N102, N102:0 to N102:63 represent Drop 2's DCS registers.

The AN-X-DCSNet supports Word Range read/write, Typed read/write, Read/Modify/Write, and PLC-3 Bit Write messages, with both logical ASCII and logical binary addressing.

To configure a topic in RSLinx to access data on the AN-X-DCSNet:

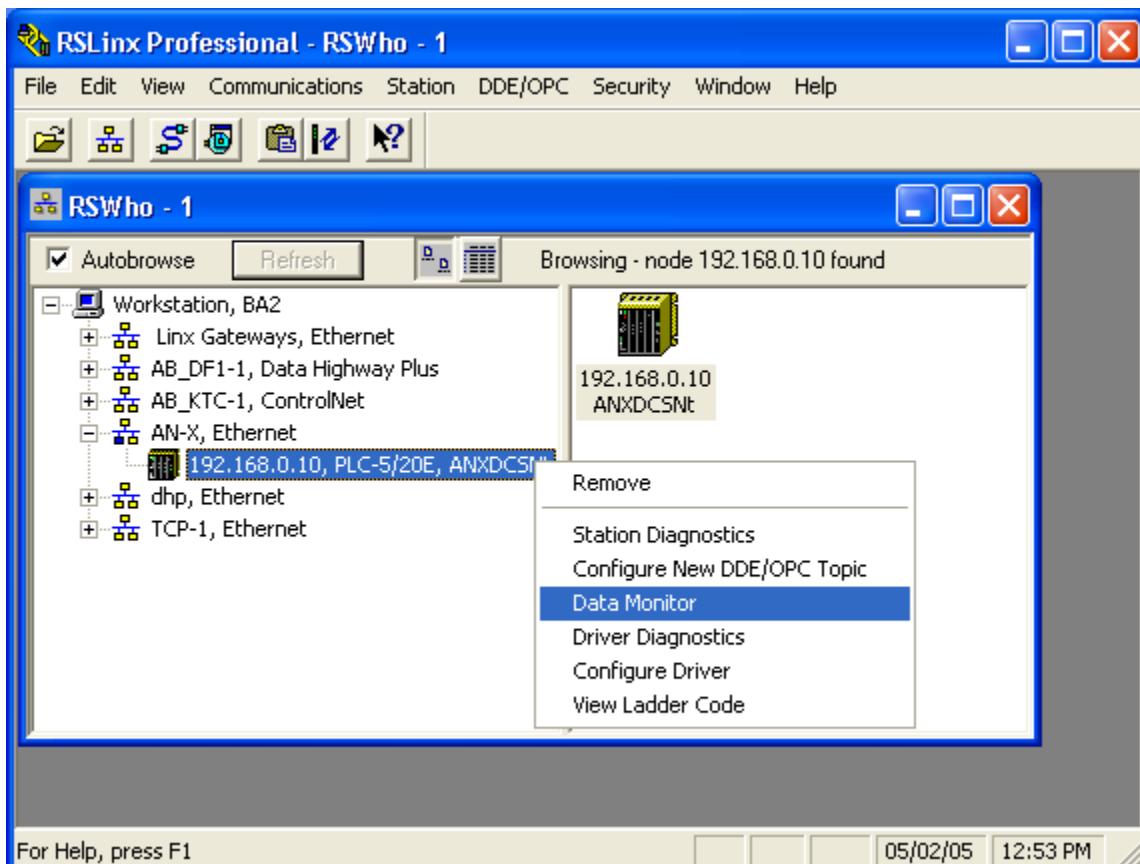
1. Create a new topic. From the main menu select *DDE/OPC/Topic Configuration*. Click *New* and give the topic a name.
2. For the Data source, browse the path to the AN-X module and click *Apply*.
3. On the *Data Collection* tab, set the *Processor Type* to *PLC-5*. Check *Polled Messages* and select an appropriate update rate. Leave everything else unchecked. Click *Apply*
4. You do not need to set anything on the Advanced Communication tab.
5. Click *Done* to complete the topic configuration.

You can now access data using any DDE or OPC client capable of communicating with RSLinx.

Details for configuring other OPC servers are found in technical notes on the QTS website, www.qtsusa.com.

Using RSLinx to View Data

AN-X appears to RSLinx to be an Ethernet PLC-5, specifically a PLC-5/20E.



First create an Ethernet driver to communicate with the AN-X.

If you right click on the AN-X module in RSLinx and select Data Monitor, a list of files appears.

File	Type	Elements	Length
N100	Integer	64	128
N101	Integer	64	128
N102	Integer	64	128
N103	Integer	64	128
N104	Integer	64	128
N105	Integer	64	128
N106	Integer	64	128
N107	Integer	64	128
N108	Integer	64	128
N109	Integer	64	128
N110	Integer	64	128
N111	Integer	64	128
N112	Integer	64	128
N113	Integer	64	128
N114	Integer	64	128
N115	Integer	64	128
N116	Integer	64	128
N117	Integer	64	128
N118	Integer	64	128

Each file corresponds to the data for one DCS drop. File N100 corresponds to drop 0, N101 corresponds to drop 1 and so on.

To view the drop data, double click on the appropriate file.

	0	1	2	3	4	5	6	7	8	9
N100:0	0	0	0	0	-1	-1	-1	255	0	0
N100:10	0	0	1	0	-26131	0	0	0	0	-22126
N100:20	55	0	0	0	0	0	0	0	0	0
N100:30	0	0	423	0	0	0	0	0	0	0
N100:40	0	0	0	0	0	0	0	0	0	0
N100:50	0	0	0	0	0	0	95	122	103	211
N100:60	89	105	100	301						

Status: Active Selection: N100:0

To change the display format, right click on the data display and select *Properties*, then select the format you want.

Using AnxInit

AnxInit is a 32-bit Windows application supplied with AN-X to perform the following functions:

- Locate and identify AN-X modules on the Ethernet network
- Select a specific AN-X for configuration
- Set the IP address and other network parameters for an AN-X
- Restart an AN-X
- Display information about the selected AN-X
- Read the kernel parameters for the selected AN-X
- Update the flash (low level firmware) on the selected AN-X
- Update the firmware on the selected AN-X
- Patch the firmware on the selected AN-X

In addition, it can be used to:

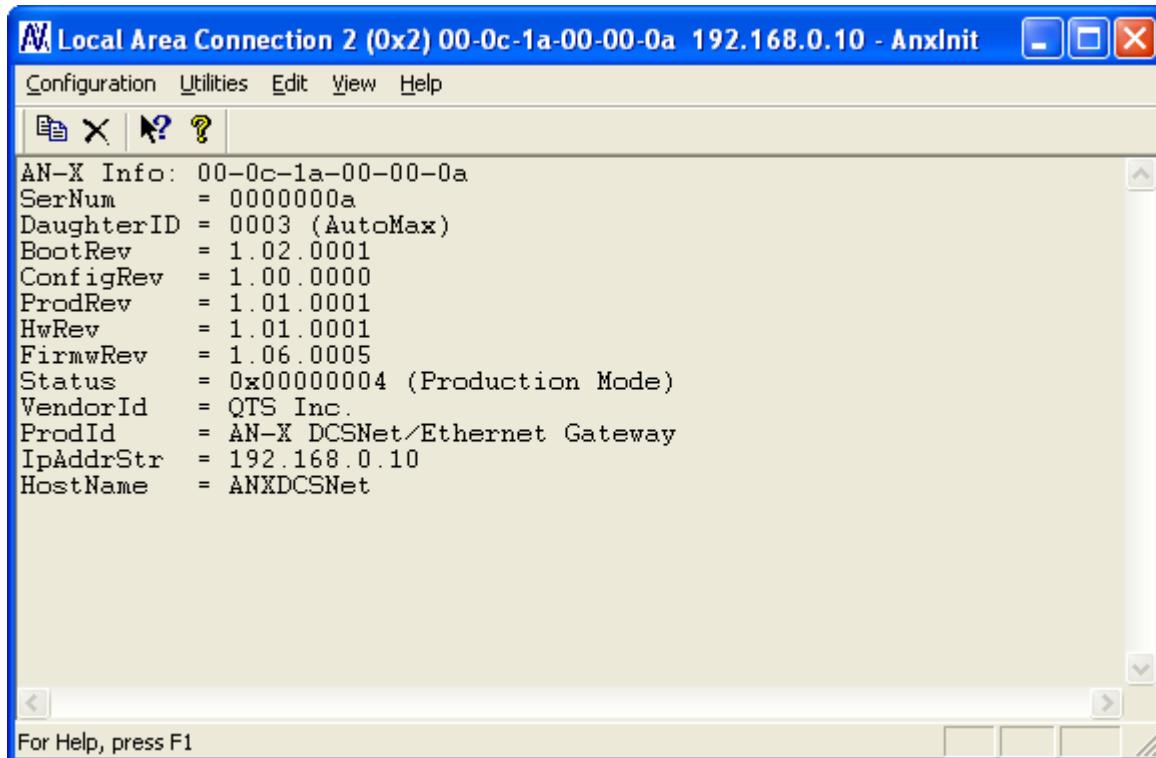
- clear the AnxInit log
- copy the contents of the log to the clipboard for use by another application. This is often useful for technical support

AnxInit Log

AnxInit logs messages in its main window. These messages are often useful for determining the cause of errors or for technical support.

To clear the log, select *Edit/ClearLog*.

To copy the contents of the Log to the Windows clipboard so that they can be pasted into another application, select *Edit/Copy*.



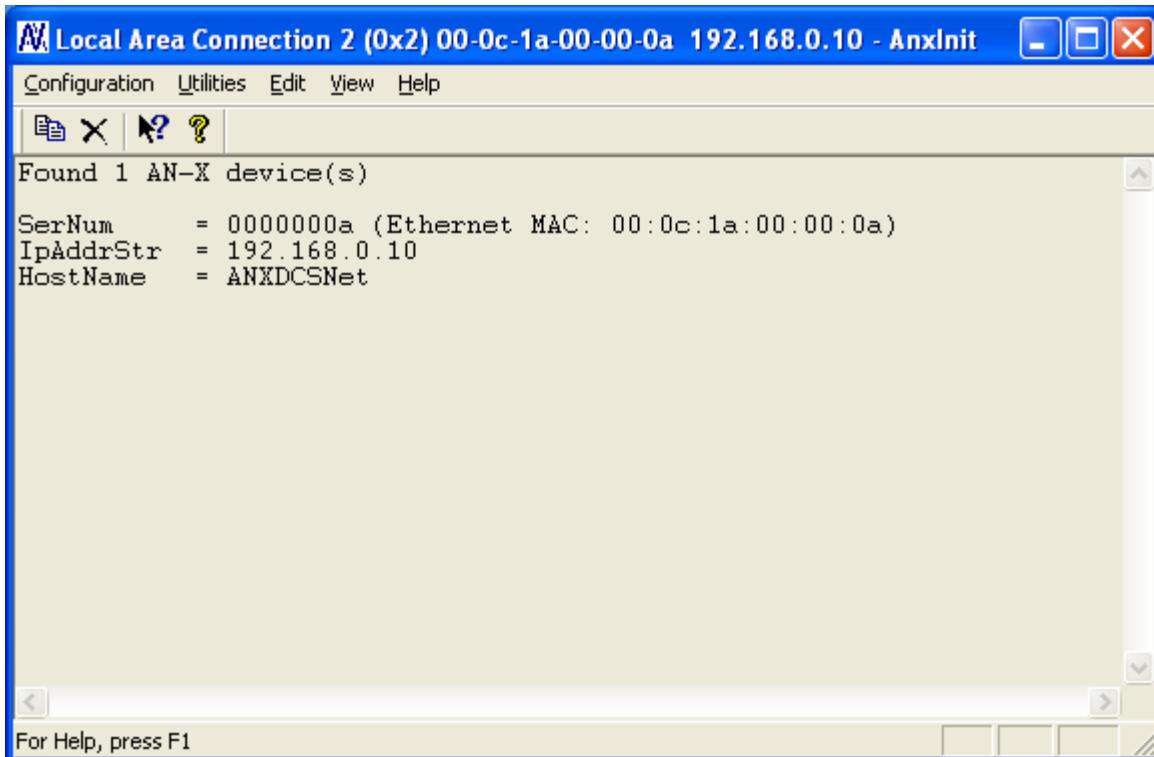
AN-X Log

Locating Available AN-X Modules

To locate all accessible AN-X modules on the Ethernet network, select *Utilities/Locate All AN-X Modules*.

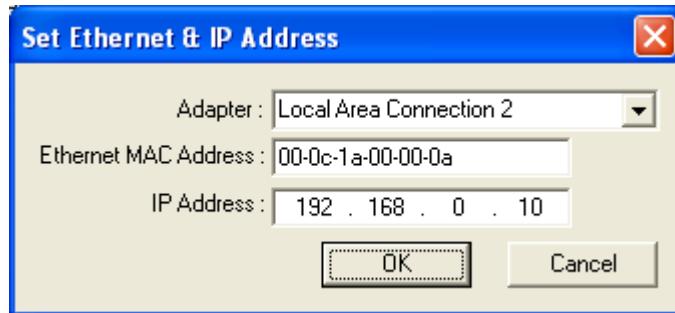
AnxInit displays a list of the AN-X modules it finds, showing their MAC IDs, IP addresses and host names.

This command is useful for determining IP addresses when they have been set by a DHCP server or for confirming that an AN-X is accessible.



Selecting an AN-X

Before you can perform an operation on an AN-X, you must select it. Choose *Utilities>Select An AN-X* to select a specific AN-X.



From the Adapter list, select the network adapter that connects to the Ethernet network that contains the AN-X.

In the *Ethernet MAC Address* field, enter the MAC Address of the AN-X you wish to select. It can be found on the AN-X label or using the *Locate All AN-X Modules* command. The format is as shown above, six pairs of hexadecimal digits separated by hyphens.

In the *IP Address* field, enter the Ethernet IP address of the AN-X you wish to select. It can be found using the *Locate All AN-X Modules* command. The format is as shown above, four decimal numbers each in the range 0 to 255.

Both MAC address and IP address must match the settings on the AN-X in order for communication to occur.

Click OK to select the AN-X.

The title bar of AnxInit shows the MAC Address and IP Address of the currently selected AN-X.

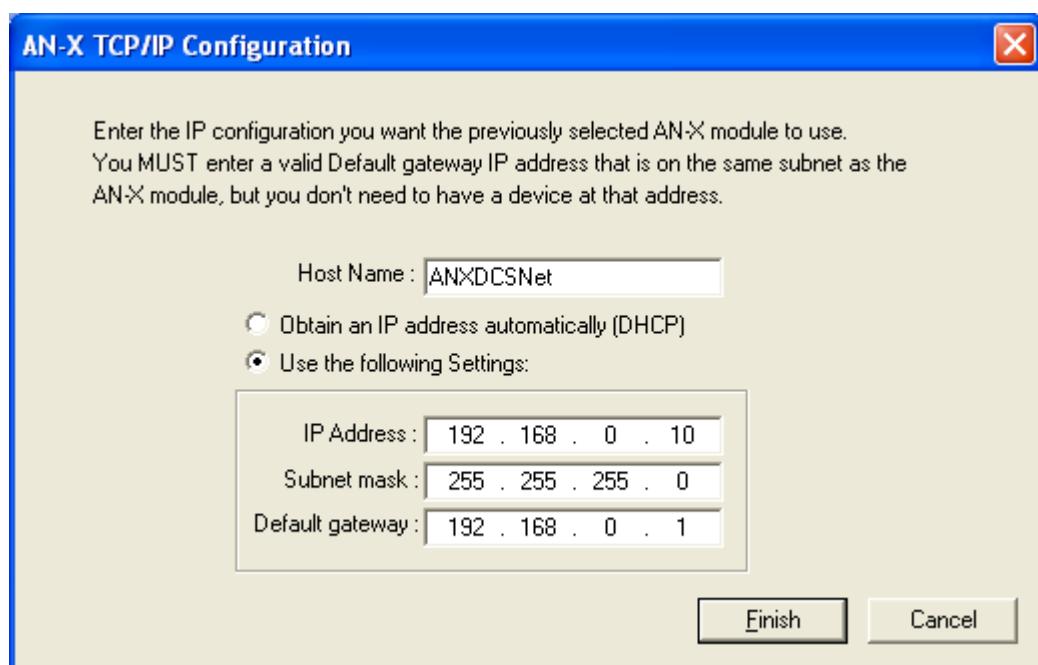
Set AN-X IP Configuration

Utilities/AN-X IP Configuration sets the AN-X IP address and hostname.

The AN-X must be on the local Ethernet to set its IP address.

First select the AN-X using the *Utilities>Select An AN-X command*.

Next select *Utilities/AN-X IP Configuration*. The *AN-X TCP/IP Configuration* dialog appears.



Enter a *Host Name* for the AN-X. This name is used internally by AN-X and may be used to identify the AN-X if you have a DNS server on your network. The name can be from 1 to 31 characters long.

To configure the AN-X to obtain its IP address from a DHCP server on the network, select *Obtain an IP address automatically (DHCP)*

To configure the AN-X to use a static IP address, select *Use the following Settings* and enter the following:

- the desired IP address for the AN-X.
- the Subnet mask for the AN-X

- the default gateway for your network.

You must enter a valid default gateway address even if there is no device at the gateway address on the network.

Click OK to complete the configuration.

Utilities/AN-X IP Configuration resets the selected AN-X. Use the *Utilities/Restart AN-X* to restart the AN-X in production mode.

If you Cancel the *Utilities/AN-X IP Configuration* command, AN-X is left running the boot code. Use the *Utilities/Restart AN-X* command to restart the AN-X.

Restart an AN-X

Use the *Utilities/Restart AN-X* command to restart the currently selected AN-X.

AN-X Info

The *Utilities/AN-X Info* command provides information about the currently selected AN-X in the log window.

The information shown:

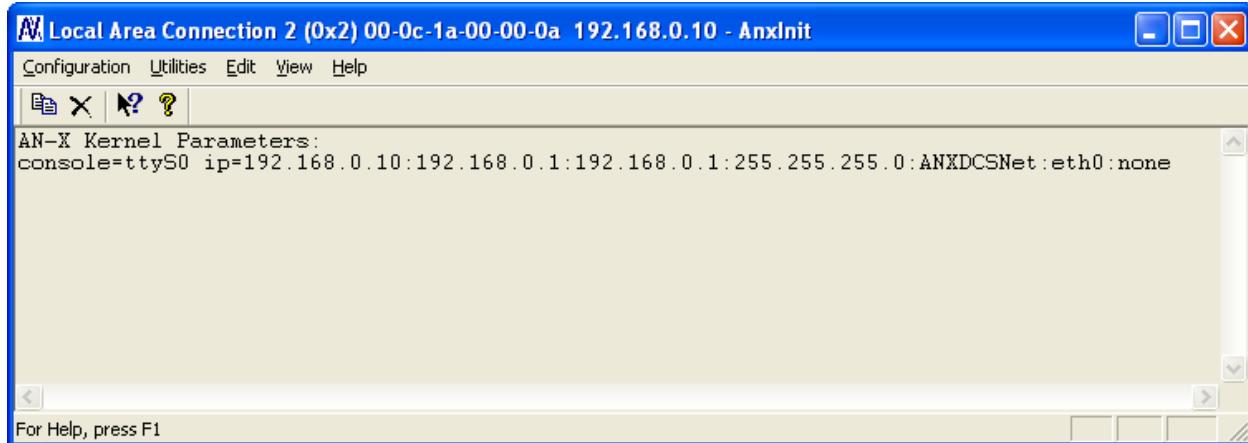
AN-X Info	Ethernet MAC address
SerNum	Serial number
DaughterID	Daughterboard ID, 3 for AN-X-DCSNet
BootRev	Boot code version
ConfigRev	Configuration kernel version
ProdRev	Production kernel version
HwRev	Hardware version
FirmwRev	Firmware release version (depends on current operating mode)
Status	see below
VendorId	Vendor ID
ProdId	Product ID
IpAddrStr	IP address assigned using Utilities/AN-X IP Configuration
HostName	name assigned using Utilities/AN-X IP Configuration

In boot mode, FirmwRev, Vendor ID and Product ID and not valid, and IpAddrStr and HostName are not shown.

Read Kernel Parameters

The *Utilities/Read Kernel Parameters* command displays various communications parameters for the currently selected AN-X

This command resets the AN-X. You will be warned and given the opportunity to cancel the command.



The *Utilities/Read Kernel Parameters* command leaves the AN-X running the boot code. Use the *Utilities/Restart AN-X* command to restart the AN-X in production mode.

Run Config Mode

The *Utilities/Run Config Mode* command is used to restart the currently selected AN-X in configuration mode (normally used internally for updating firmware).

This command is not used in normal operation but may be required for technical support.

The AN-X is in configuration mode when the SYS LED flashes red twice, followed by a pause.

To exit configuration mode, use the *Utilities/Restart AN-X* command to restart AN-X in production mode.

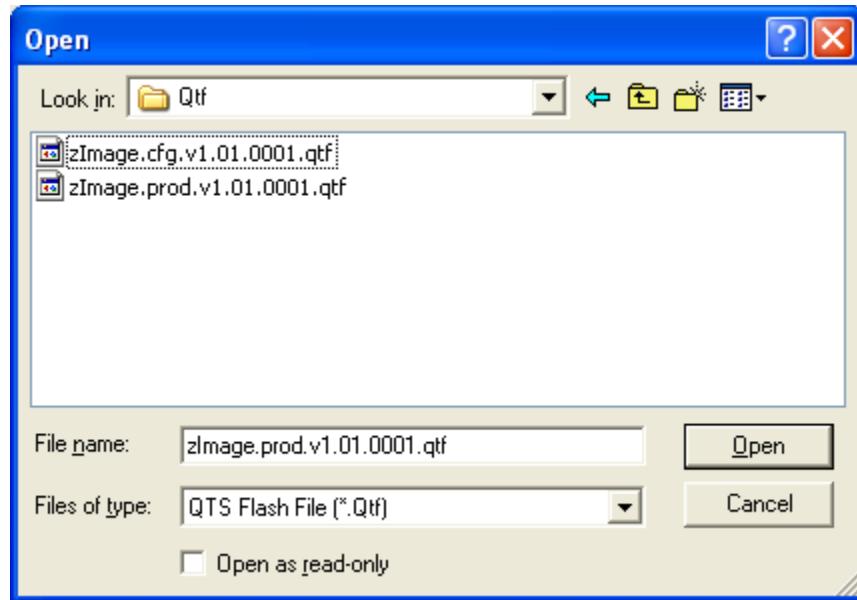
Update AN-X Flash

The *Utilities/Update AN-X Flash* command updates the low-level firmware (configuration and production kernels).

Files have extension qtf and are found on the AN-X distribution CD.

This command resets the AN-X. You will receive a warning and be given the opportunity to Cancel the command.

If you cancel at the filename dialog, the AN-X has already been reset and is in boot mode. Use the *Utilities/Restart AN-X* command to restart it in production mode.



Update Firmware

There are two ways to update all the firmware in an AN-X module.

1. The *Configuration/Firmware Update* command starts the firmware update wizard, which takes you step by step through the firmware update process.
2. The *Utilities/Update Firmware* command updates all the firmware on an AN-X you have selected using the *Utilities>Select An AN-X* command.

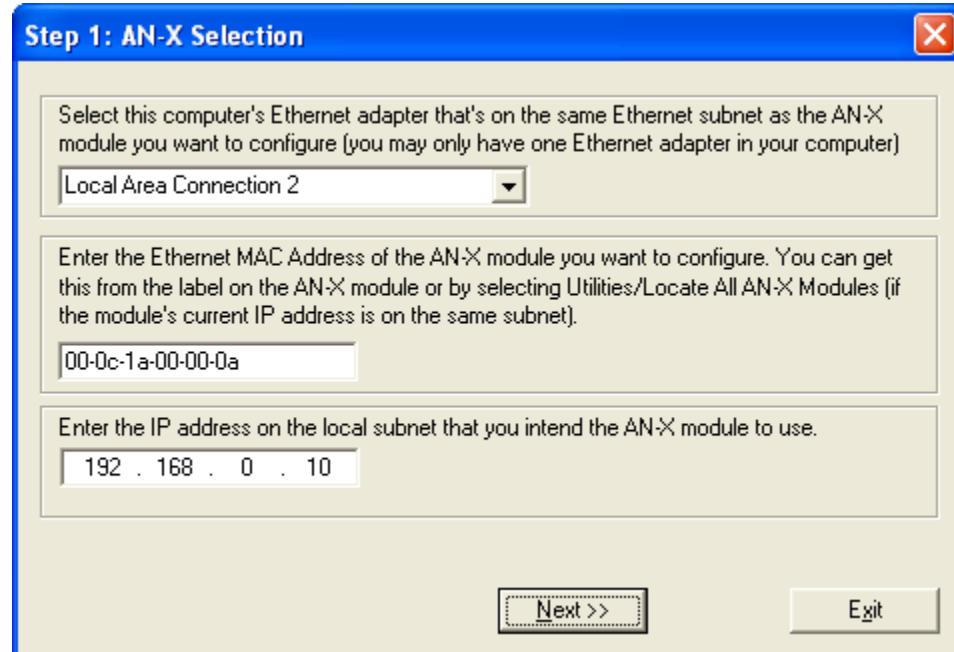
Firmware files have extension *bin*.

Firmware Update Wizard

Select the *Configuration/Firmware Update* command to start the firmware update wizard.

Step 1:

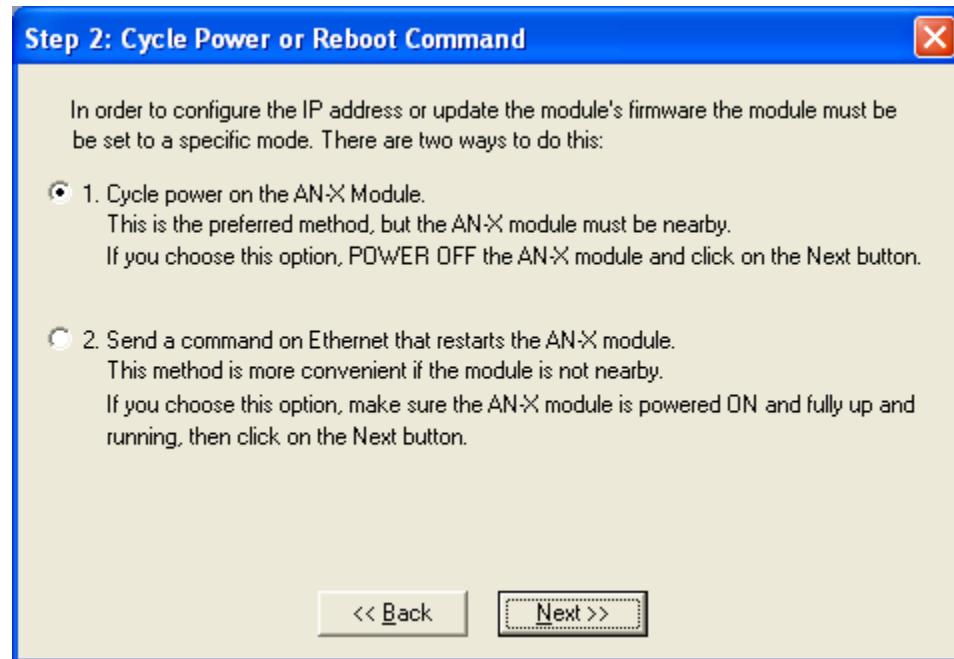
In step 1, you identify the AN-X you are configuring.



1. Select the Ethernet adapter that's connected to the AN-X. In most cases there will be just one Ethernet adapter in the computer. The AN-X must be on the same subnet as the computer.
2. Enter the MAC address of the AN-X you are updating. This is printed on the AN-X label. It consists of six pairs of hexadecimal digits, separated by hyphens. In the example above, it's 00-0c-1a-00-00-0a.
If the AN-X is already online, you can obtain its MAC address using the *Utilities/Locate All AN-X Modules* command.
3. Enter the IP address of the AN-X you want to update

Step 2

In step 2, you choose a method of restarting AN-X to put it in config mode.

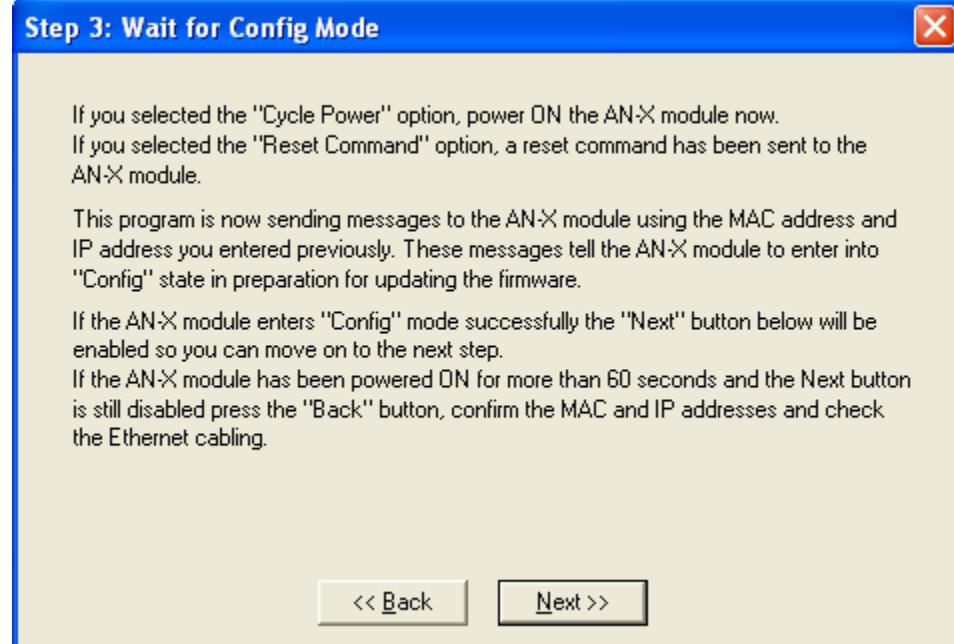


The preferred method is to cycle power on the AN-X. Select the first option on the screen and click the *Next >>* button.

The second method, useful if the AN-X is not easily accessible, is to send it a command over Ethernet. The AN-X must be powered on and completely running for this method to work. For example, if this is the first time you are configuring a new AN-X, allow sufficient time for it to acquire an IP address from a DHCP server or to time out and use its default IP address (about 3 minutes). Select the second option on the screen and click the *Next >>* button.

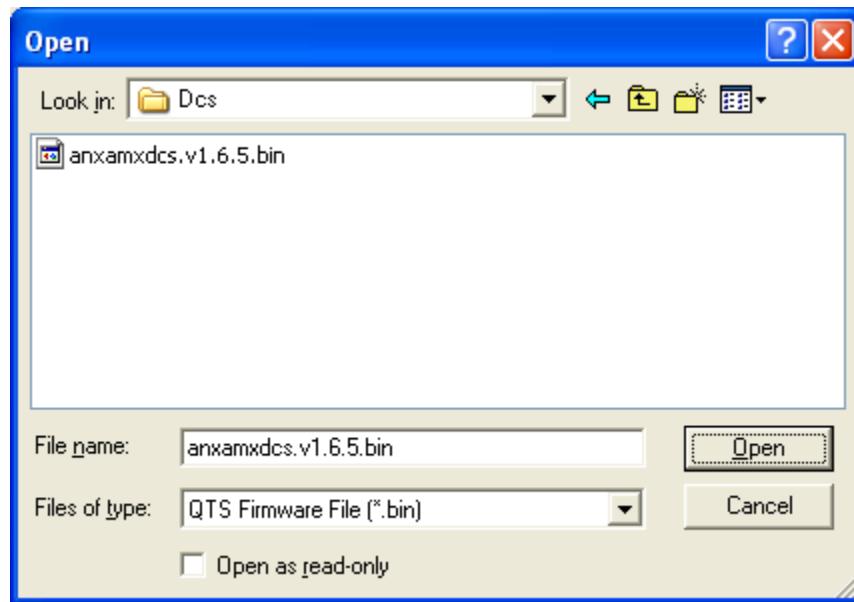
Step 3:

Wait for AN-X to enter config mode. While AnxInit is waiting, the *Next >>* button will be disabled. When AN-X is in boot mode, the *Next >>* button will be enabled.



If the AN-X does not enter config mode within about 60 seconds, return to the previous screens and check the entries.

Click the *Next>>* button, and select the firmware file you want to download and click *Open*.



AnxInit transfers the firmware file and restarts the AN-X.

After you run update the firmware, you must reconfigure the AN-X and restore:

- DCS drop number and depth

- ControlLogix configuration
- AN-X to AN-X configuration

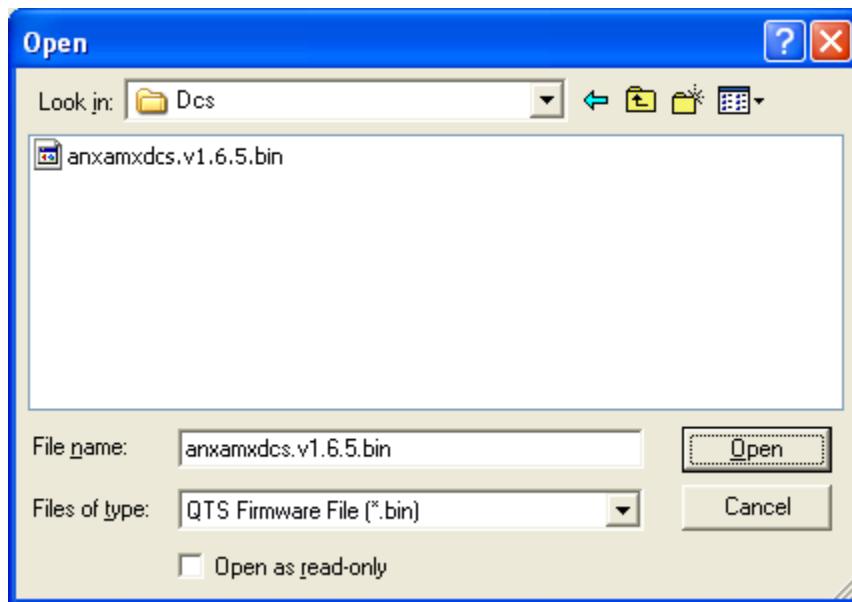
Update Firmware Command

The *Utilities/Update Firmware* command updates all the firmware on an AN-X you have previously selected using the *Utilities>Select An AN-X* command.

This command resets the AN-X. You will receive a warning and be given the opportunity to Cancel the command.

If you cancel at the filename dialog, the AN-X has already been reset and is in configuration mode. Use the *Utilities/Restart AN-X* command to restart it in production mode.

Click the *Next>>* button, and select the firmware file you want to download and click *Open*.



AnxInit transfers the firmware file and restarts the AN-X.

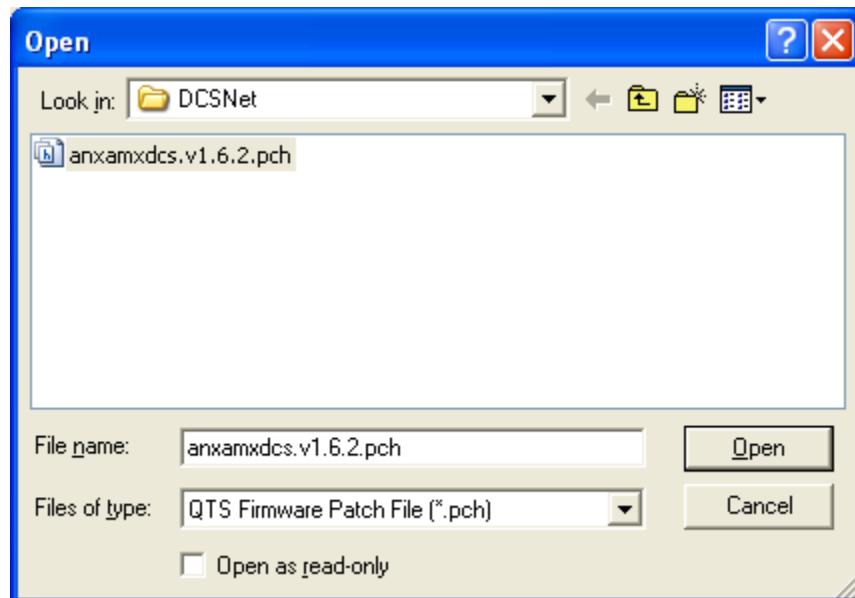
After you run update the firmware, you must reconfigure the AN-X and restore:

- DCS drop number and depth
- ControlLogix configuration
- AN-X to AN-X configuration

Patch Firmware

The *Utilities/Patch Firmware* command applies small patches to the firmware running on the AN-X.

These patch files files have extension *pch*.



This command resets the AN-X. You will receive a warning and be given the opportunity to Cancel the command.

You do not have to reconfigure the AN-X after applying a patch. All configuration information will be left intact.

When the patch has been applied, AnxInit restarts the AN-X in production mode.

If you cancel at the filename dialog, the AN-X has already been reset and is in configuration mode. Use the *Utilities/Restart AN-X* command to restart it in production mode.

Using the Web Interface

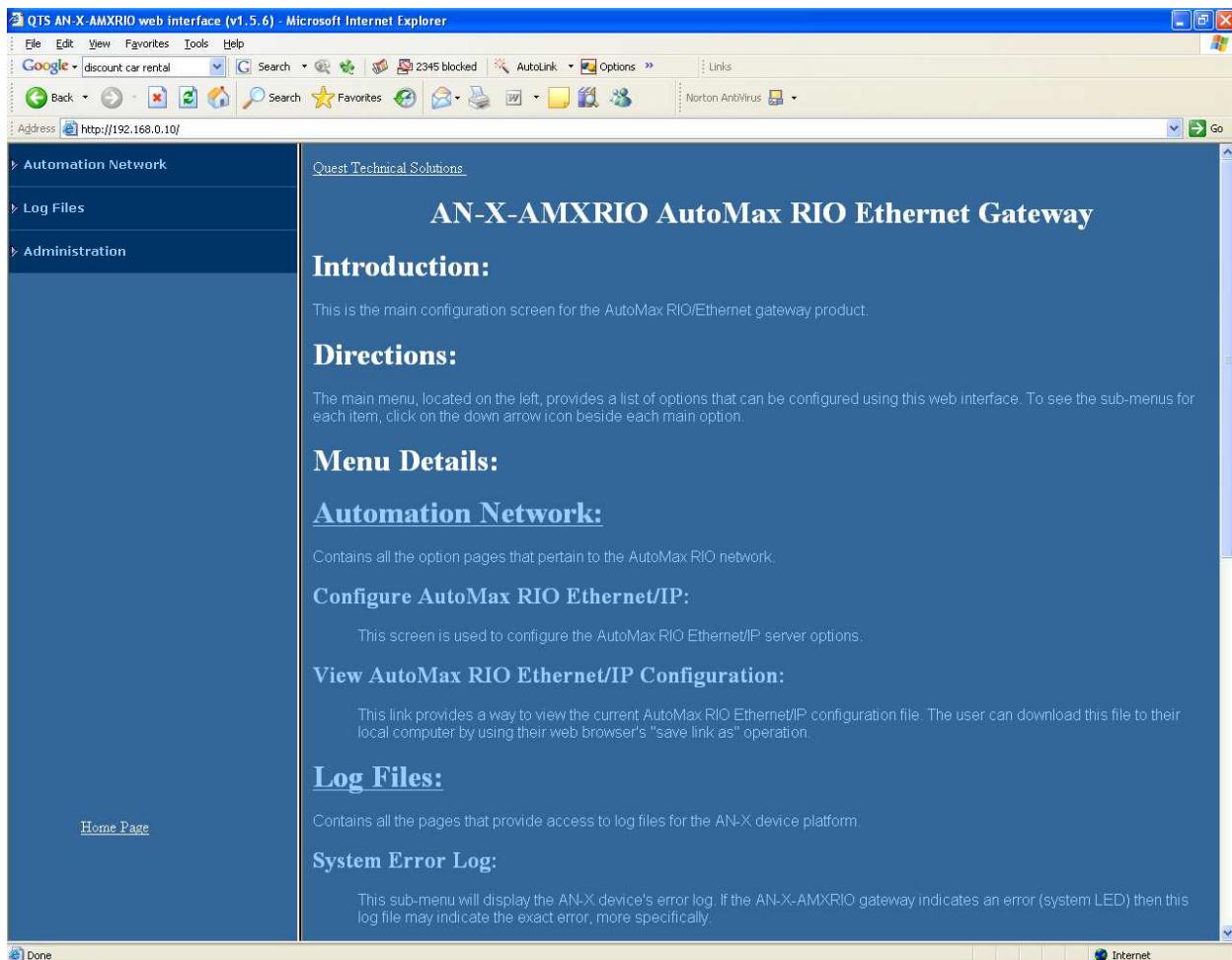
The AN-X module contains a webserver capable of communicating with standard web browsers such as Internet Explorer or Netscape.

The web interface is used for:

- setting the DCSNet configuration (drop number and depth)
- uploading ControlLogix and AN-X to AN-X configuration files
- monitoring DCS data
- viewing AN-X logs

To use the web interface, you need to know the IP address of the AN-X. Use the *Utilities/Locate All AN-X Modules* command in AnxInit to find all AN-X modules on the Ethernet network.

To access the web interface, start your web browser and type the AN-X IP address where you normally enter web addresses in the browser.

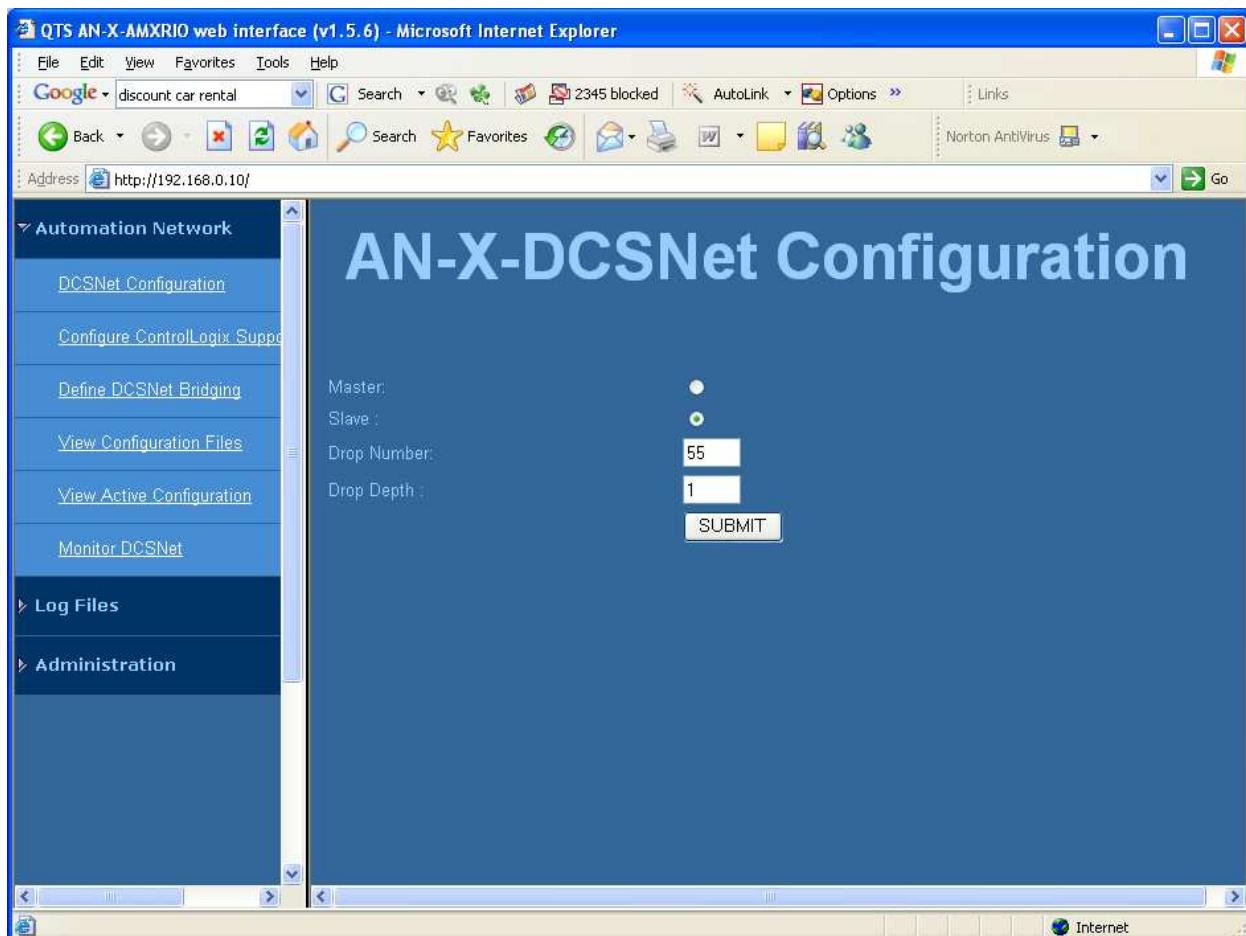


The left pane contains commands. Click on the arrows at the left of the main headings to expand or contract the sections.

The contents of the right pane depend on the current command being executed.

DCSNet Configuration

Select *Automation Network/DCSNet Configuration* to set the DCS drop number and depth.



AN-X-DCSNet can be used as a DCS master or slave. Check Master or Slave to select which one you want.

If the AN-X-DCSNet is a DCS slave, enter the Drop Number and Drop Depth. These entries are ignored if the AN-X is a DCS master.

The default AN-X configuration is DCS slave, drop 55, depth 1.

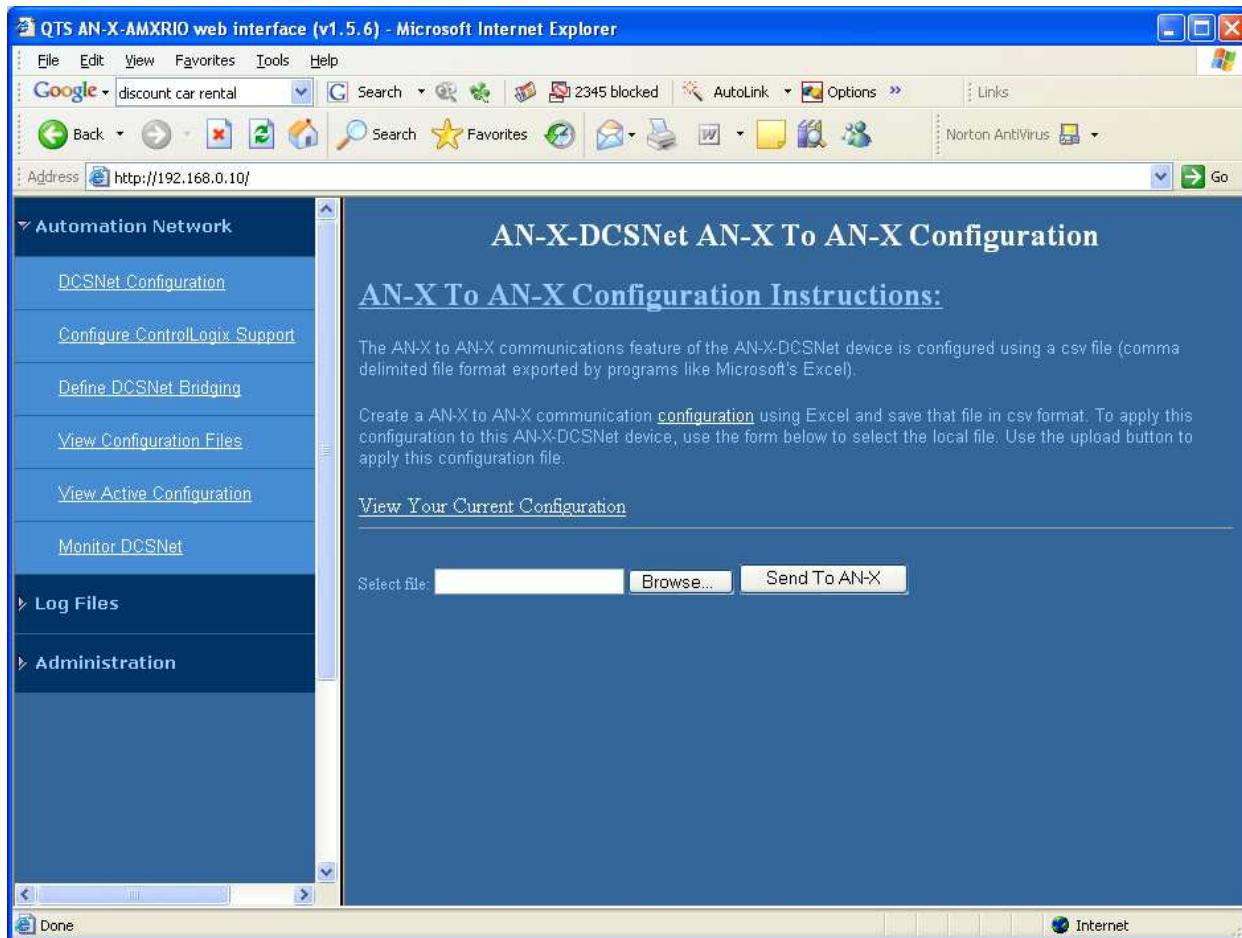
Click the SUBMIT button to send the values to AN-X.

If you are using ControlLogix Support or AN-X to AN-X communication, check the logs for these applications since the new DCS parameters may be incompatible with the current configurations for these applications.

Define AN-X to AN-X Communication

AN-X modules can share data with each other over Ethernet. Refer to section *AN-X to AN-X Communication* on page 35 for information on how to create a configuration file.

Select *Automation Network/Define DCSNet Bridging* in the web interface to send the configuration file to AN-X or to view the current configuration.



Type or browse the configuration file name into the *Select file:* area. Then click the *Send To AN-X* button to send the file to AN-X.

AN-X parses the file and shows either the current configuration if the upload is successful or an error message if there is a problem with the file.

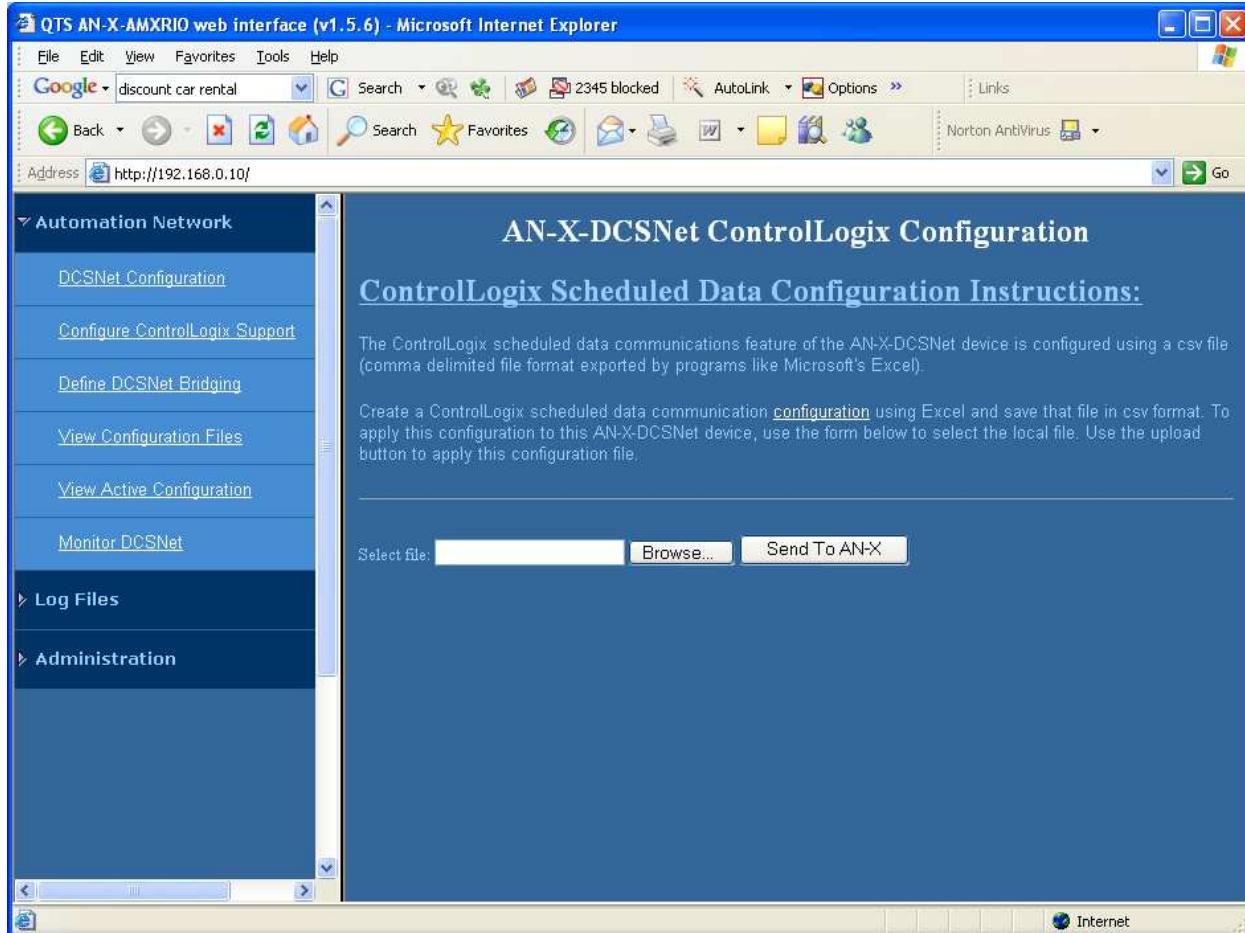
If there is an error, check the AN-X-DCSNet Bridging log to determine the cause.

To view the current configuration, click the *View Your Current Configuration* link.

Configure ControlLogix Support

AN-X can exchange scheduled data with a ControlLogix processor over Ethernet. Refer to section *Scheduled Data with a ControlLogix* on page 23 for information of configuring scheduled data exchange.

Select *Automation Network/Configure ControlLogix Support* in the web interface to upload the configuration.

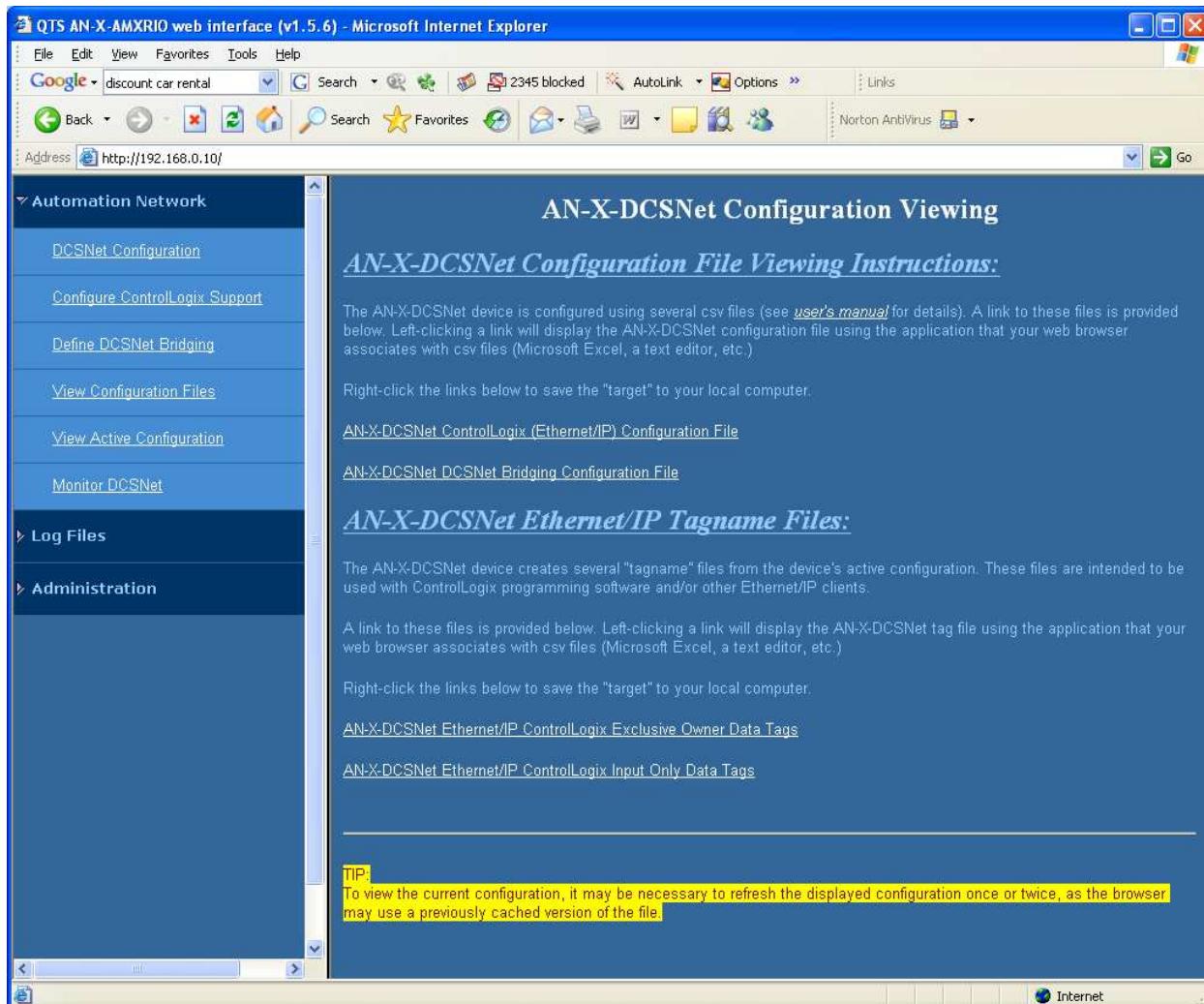


Type or browse the configuration file name into the *Select file:* area. Then click the *Send To AN-X* button to send the file to AN-X.

Check the ControlLogix Log to determine if there have been any errors with the upload.

View Configuration Files

Select *View Configuration Files* to view the ControlLogix or AN-X to AN-X configuration file.



Click on the links to view the files using the application that is associated with CSV files.

Right click on the links to retrieve the files from AN-X and store them on your computer.

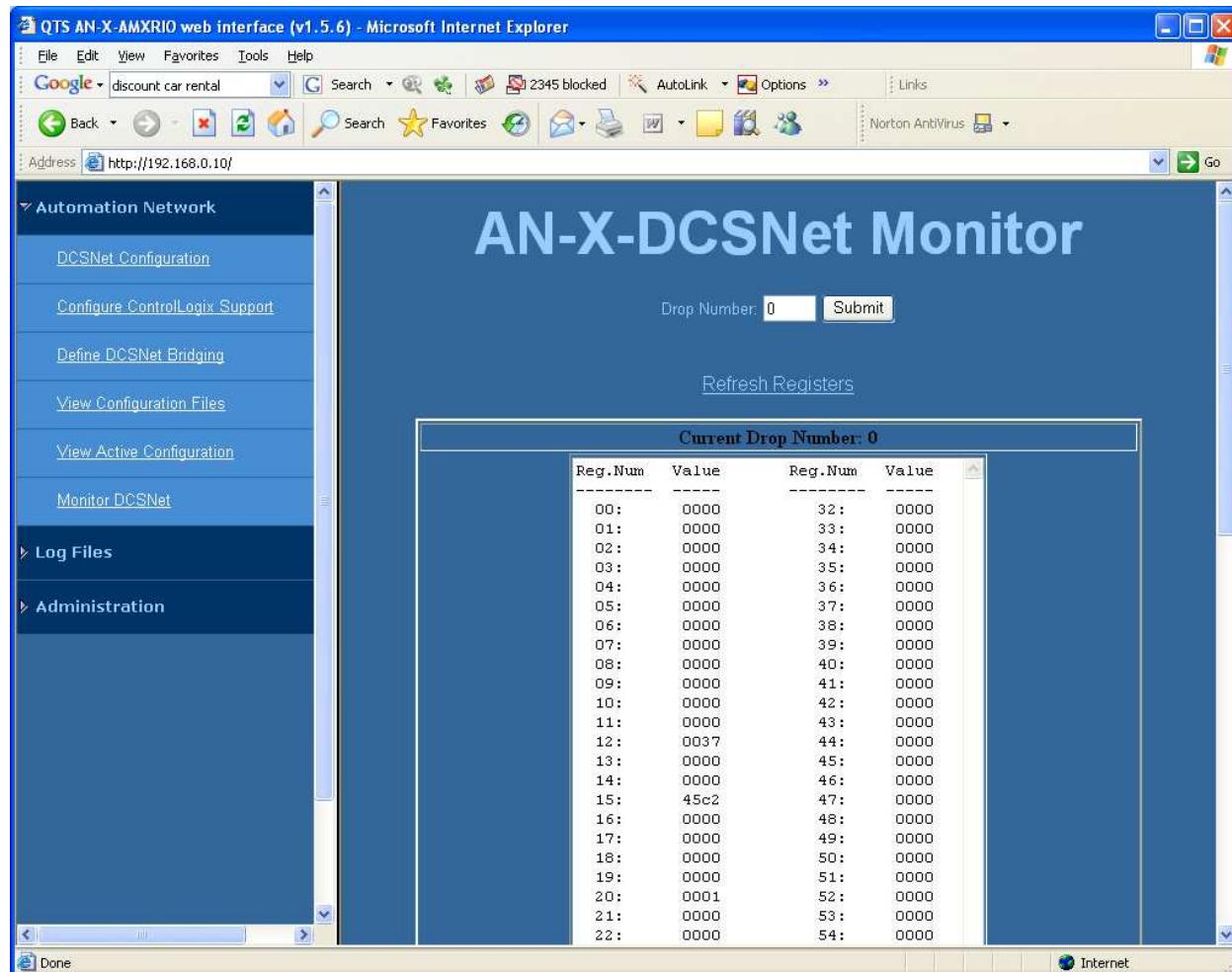
View Active Configuration

Select *View Active Configuration* to view the ControlLogix or AN-X to AN-X configuration file in the web browser.

The screenshot shows a Microsoft Internet Explorer window with the title "QTS AN-X-AMXRIO web interface (v1.5.6) - Microsoft Internet Explorer". The address bar displays "http://192.168.0.10/". The left sidebar has a tree view with nodes: "Automation Network" (DCSNet Configuration, Configure ControlLogix Support, Define DCSNet Bridging, View Configuration Files, View Active Configuration, Monitor DCSNet), "Log Files", and "Administration". The main content area is titled "AN-X-DCSNET Active Configuration Log" and contains the text: "This page displays the active configuration of the [EthernetIP](#) (ControlLogix) and the [AN-X to AN-X Bridging](#) function." Below this, a message says "Drop=55 Depth=1 DCSNet Ethernet/IP Configured Successfully".

Monitor DCS Data

To use the web interface to view the current DCS network data on the AN-X, select *Automation Network/Monitor DCSNet*.



To select the drop to be displayed, type the drop number in the Drop Number field and click *Submit*.

To update the display, click the *Refresh Registers* button.

Scroll the browser window to view all the data. The values are shown in hexadecimal.

Beneath the data display is a summary of the drop 0 diagnostic register usage (see page 69).

Log Files

AN-X maintains various logs to record diagnostic and error messages. Use the Log Files menu in the web interface to view these logs.

System Error Log

The System Error log records errors that occur during AN-X operation. This log is normally empty.

System Info Log

The System Info Log records informational messages during startup and normal operation.

AN-X-DCSNet Bridging Log

The AN-X-DCSNet Bridging Log records messages from the application that is responsible for direct AN-X to AN-X communication.

These messages include normal startup messages, messages about problems with the configuration file, and runtime errors such as timeouts.

If the log overflows, AN-X closes the log file (xanxdcsd.0) and opens a second log file (xanxdcsd.1) and continues to alternate between the two log files as each one fills up. Use View All Logs to view both log files.

ControlLogix Log

The ControlLogix Log records messages from the application that is responsible for scheduled communication with a ControlLogix processor and unscheduled communication with DDE and OPC servers.

These messages include normal startup messages, messages about problems with the configuration file, and runtime errors such as timeouts.

If there are problems with scheduled connections to the AN-X or with unscheduled messages to the AN-X, this log may provide further information on the cause of the problem.

If the log overflows, AN-X closes the log file (enetip.0) and opens a second log file (enetip.1.1) and continues to alternate between the two log files as each one fills up. Use View All Logs to view both log files.

View All Logs

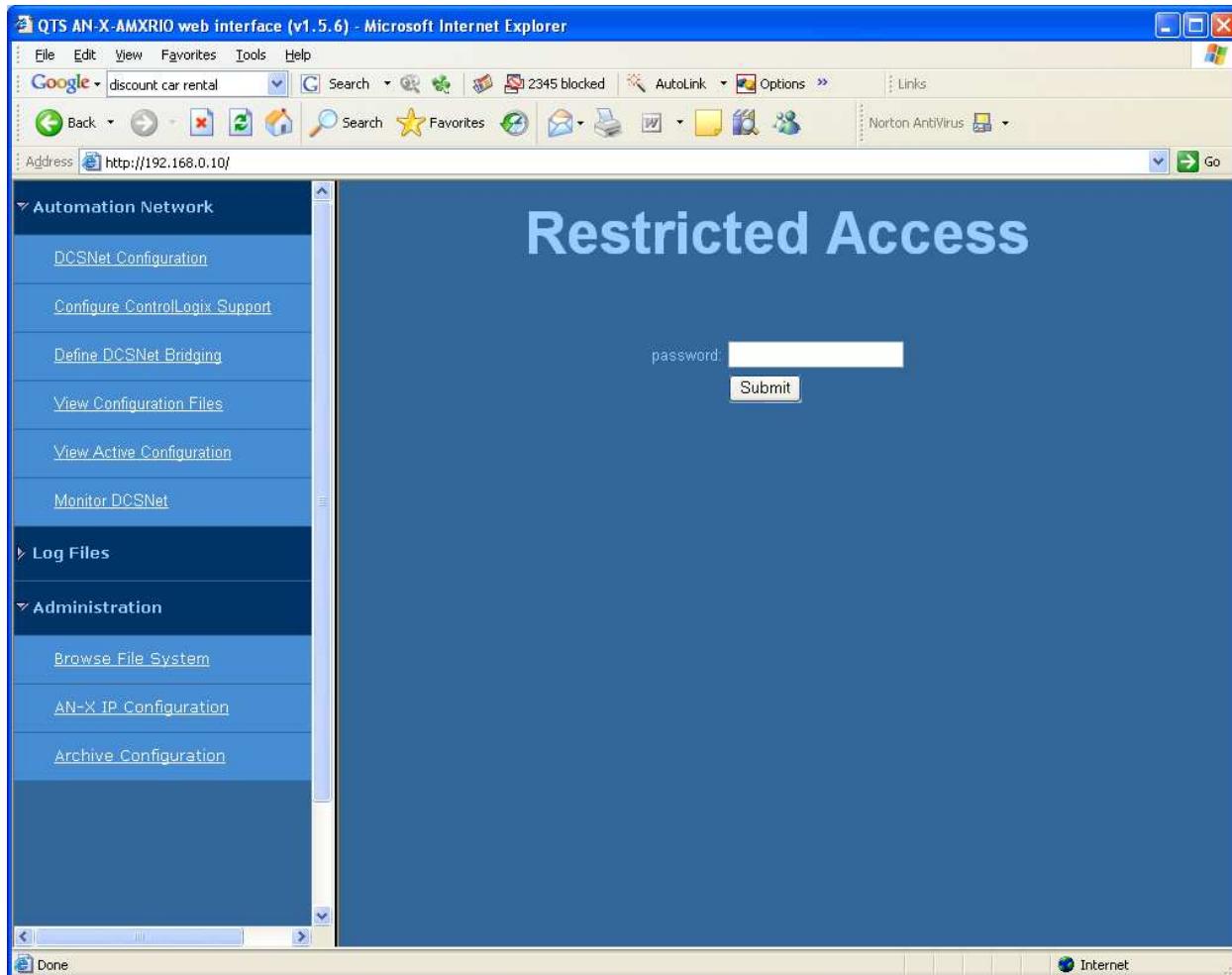
Use View All Logs to list and view all the AN-X logs. To view a log file, double click on the file name.

Administration Menu

The Administration Menu is used to set the AN-X IP address and to view and edit files on AN-X. The file edit function is password protected and is used only for AN-X technical support.

Browse File System

If you are required by QTS technical support to examine files on the AN-X, select Administration/Browse File System.

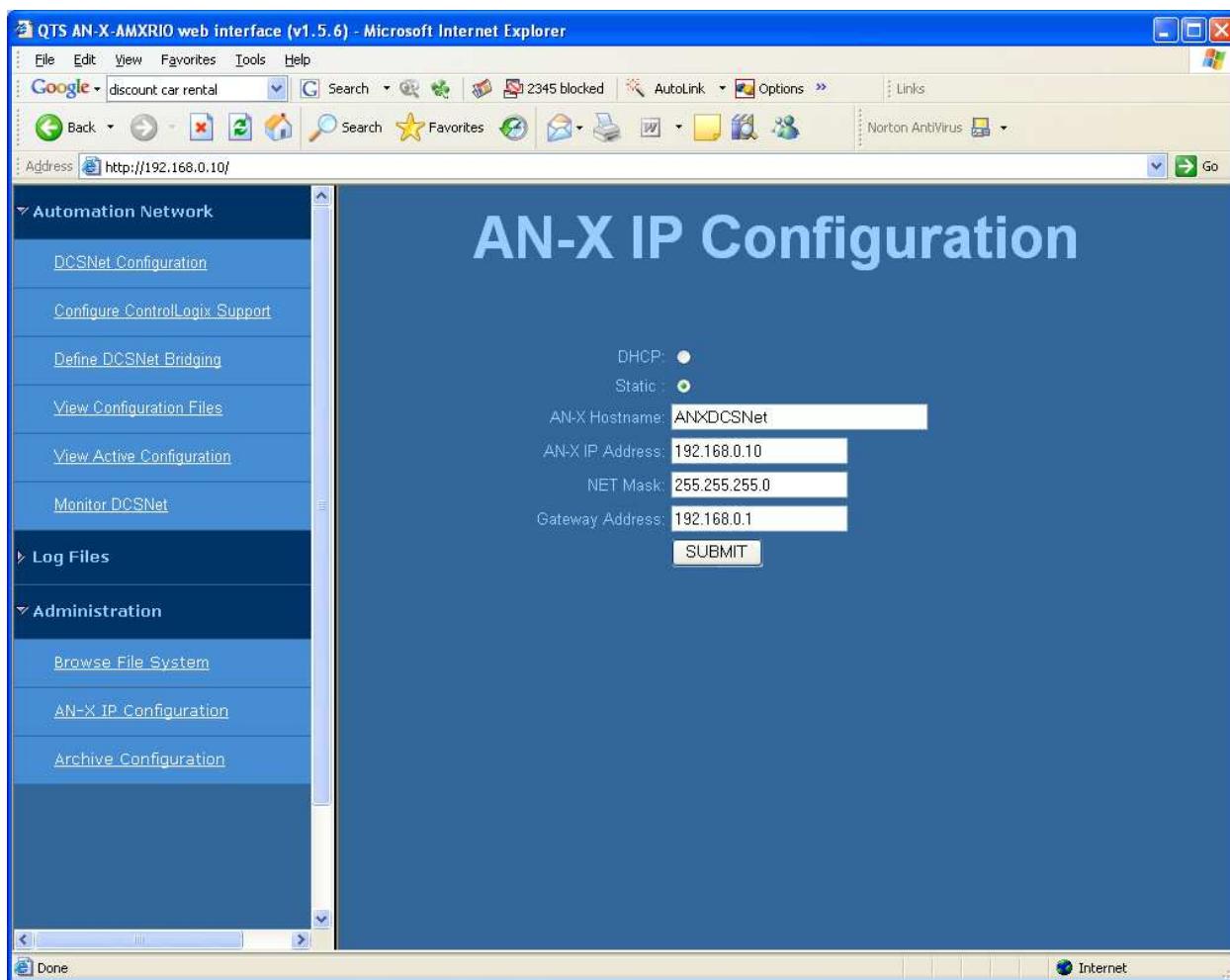


Technical support will provide the password and supply detailed information on any further steps.

AN-X IP Configuration

You can change the AN-X IP configuration from the web interface. This requires that you already know the correct IP address and can use it to access the web interface.

Select Administration/AN-X IP Configuration.



You can configure the AN-X to use DHCP or to use a static IP address.

Click SUBMIT to set the parameters.

When prompted, click CONTINUE to reboot the AN-X with the new parameters.

Archive Configuration

You can archive all the current AN-X configuration files and log files from the web interface. The archive file is a standard gzip compressed tar archive.

Select *Administration/Archive configuration*.

Click on the Archive File link and save the file. Select the destination where the file will be stored.

Troubleshooting

LEDs

The AN-X-DCSNet has LEDs that indicate the state of the Ethernet connection, the connection to the DCS network processor, and the overall module state.

Ethernet LEDs

There are two LEDs that indicate the state of the Ethernet connection.

The orange LED, labelled 100, is on if the link is running at 100 Mbits/second and is off otherwise.

The green Link/Act LED is off if the link is inactive and is on if the link is active. If activity is detected, the link blinks at 30 ms intervals and continues blinking as long as activity is present.

SYS LED

The SYS LED is used by the AN-X operating system and software to indicate the state of operations and errors.

It should be used in conjunction with the logs to locate the cause of problems.

In the following, red 3 means three red flashes followed by a pause, and so on.

SYS LED State	Possible cause
Red 2	AN-X is in config mode
Red 3	DHCP configuration failed
Red 4	Fatal application error, check logs for cause
Red 5	Application memory access violation, check logs
Red 6	Application failed, illegal instruction, check logs
Red 7	Application crashed, unknown cause, check logs
Fast red flash	Reconfiguration (set drop number and depth) failed Configuration of ControlLogix support failed Configuration of AN-X to AN-X communication failed
Single red flash	AN-X to AN-X communication problem, error on producer or timeout on consumer ControlLogix scheduled data or unscheduled

SYS LED State	Possible cause
Red 2	AN-X is in config mode
	messaging, addressing or connection problem
Slow red flash	script or application problem during startup

At startup, the SYS LED sequence is:

- boot code starts – fast flashing red
- boot code loads a kernel – solid red
- if the configuration kernel is loaded, 2 red flashes followed by a pause
- if the production kernel loads with no errors, solid green

NET LED – DCS Network Status

The NET LED indicates the status of the DCS network connection.

DCS Master

All drops operating correctly	Solid green
No other drops	Yellow
Network error	Flashes red

DCS Slave

All drops operating correctly	Solid green
No other drops	Solid red
Network error	Flashes red

DCS Diagnostic Counters

AN-X maintains standard DCS drop 0 diagnostic counters. Use *Automation Network/Monitor DCSNet* in the web interface to view the diagnostic counters.

The counters are:

Register	Meaning
4-7	Drop status table
12	Local station's drop number
14	Messages received
15	Receive timeouts

Register	Meaning
16	CRC errors
17	Overrun errors
18	Abort errors
19	Messages transmitted
20	Local station's drop depth

In the drop status table, register 4 contains status for drops 0 to 15, bit 0 corresponds to drop 0 (the master), bit 1 corresponds to drop 1, and so on. Register 5 contains the status of drops 16 to 31, register 6 contains the status of drops 32 to 47 and register 7 contains the status of drops 48 to 55.

Updating the Firmware

The AN-X operating software consists of several parts:

- boot code, runs at startup
- configuration kernel, runs when you update firmware
- production kernel, runs in normal operation
- application software, for DCS communication, scheduled communication with ControlLogix and unscheduled messaging, and AN-X to AN-X communication

The kernels are supplied in file with extension *qtf* and are updated using the AnxInit utility. Run the command *Utilities/Update AN-X Flash* and select the file you wish to download. Refer to page 51 for details.

Firmware files contain the application programs for AN-X and have extension *bin*. They are downloaded using the command *Configuration/Firmware Update* or *Utilities/Update Firmware* in AnxInit. Refer to page 52 for details.

Occasionally individual patch files are released. They have extension *pch* and are downloaded using the *Utilities/Patch Firmware* command in AnxInit. Refer to page 56 for details.

Reading Version Numbers

To read the version numbers of the various software components:

Boot code	AnxInit – AN-X Info
Configuration kernel	AnxInit – AN-X Info
Production kernel	AnxInit – AN-X Info
Firmware	AnxInit – AN-X Info (version depends on current mode, boot, configuration or production)
Individual applications	
AN-X to AN-X communication	Web interface, AN-X-DCSNet Bridging log
ControlLogix scheduled communication and unscheduled messaging	Web interface, ControlLogix Log

Obtaining the Latest Software

Version numbers and software for the most recent AN-X releases are available from the QTS website, www.qtsusa.com

Specifications

Parameter	Specification
Function	Bridge between Ethernet and AutoMax DCS network
Description	Processor: 100MHz IDT MIPS FLASH memory: 64M RAM: 64M
Typical Power Consumption	300 mA @ 12 VDC or 150 mA @ 24 VDC
Maximum Power dissipation	3.6W
Environmental Conditions:	
Operational Temperature	0-50°C (32-122°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5-95% without condensation

Support

Technical support is available from Quest Technical Solutions.

Quest Technical Solutions

4110 Mourning Dove Court
Melbourne FL 32934
321 757-8483

website: qtsusa.com

email: support@qtsusa.com

If you need to make a return, contact QTS to obtain a return authorization number.